Evaluation of Antibiotics Sensitivities against Some UTI Pathogens

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ABSTRACT

The bacterial resistance against most well defined antibiotics particularly those which isolated from UTI cases still form a big problem. This study was planned to investigate the effect of same antibiotic with different sources on bacterial isolates from UTI cases. Three hundred bacterial UTI cases were studied for bacterial isolates and E. coli, Proteus spp. and Klebsiella spp. were observed to form the main causative agents. One hundred from each were tested for their sensitivity for Ampicillin, Cephatoxim, Gentamicin, Nalidixic acid and Nitrofuratoin. This study revealed that the effect of locally manufactured Iraqi antibiotics on the bacterial isolates was comparable to English ones. Further more the best inhibitors antibiotic was Nitrofurantoin either Iraqi or from English origin. In view of the results it could be concluded that Nitrofurantoin was the best antibiotic for UTI cases and the Iraqi manufactured antibiotic are efficient as well as the English ones.

Keywords
UTI, Antibiotics Sensitivity, Enterobacteriacea.

Introduction

Since the advent of penicillin in (1940s) there were tremendous efforts by scientist to find new ones and prove the available antibiotics. However, the bacterium protect it self against the man weapon (i.e. antibiotics) by mutations or others means to survive. The struggle between the man and bacteria will continue for ever, but the last-word will be for the human.

Many workers devoted their times and efforts to find a suitable antibiotics which is less expensive and safe to use in man.

An investigation on children with UTI, denoting that E. coli was the infecting bacterium in majority of cases while, Proteus spp. was the next; most common and both were sensitive to Nalidixic acid, later it appeared that nalidixic acid is a drug of choice against E. coli and Proteus among children UTI cases (Keebene, 1965). These facts was confirmed by other workers, when reported that Nalidixic acid is a valuable antibiotic agent for the treatment of E. coli (Newman, 1996). Two hundred and nine samples for UTI cases were undergone bacterial isolation in an investigation. It was demonstrated that E. coli is the most common organism isolated followed by Klebsiella spp. and Enterbacter spp. It was declared that (46%) of these
strains are sensitive to Nalidixic acid (Dytan et al., 1999). On the other hand, it was denoted that the resistance of Proteus strains for Penicilllin, Tetracycline & Streptomycin with highly sensitivity to Gentamicin (Dikyi, 1971).

Many studies confirmed Proteus sensitivity to Gentamicin and Sionicen. Regarding the Ampicillin, scientists reported that this antibiotic is highly effective against E. coli and P. mirabilis (Anderson et al., 1964). Similarly, it was found that 241, bacteria which were isolated from patients with UTI, all were sensitive to ampicillin (Brumfitt et al., 1962). On the contrary other studies reported that (45) strains of Proteus mirabilis which were isolated from various clinical conditions were resistant to Ampicillin. Similarly with E. coli, studies revealed that > 50% of these strains which were urinary isolates, were resistant to Ampicillin (Rossi et al., 1999). While other study denoted that 65% of E. coli strains isolated from hospitalized children with UTI, were resistant to Ampicillin (Valdivieso et al., 1999).

More than 50% of (360) isolates of E. coli were sensitive to Gentamicin and Nitrofurantoin. On the other hand, among the cases of community acquired acute cystitis; Nitrofurantoin was observed the most effective drug not only for E. coli (90%), but also for all the isolates (Achla et al., 2004).

Other antibiotic such as Nalidixic acid was reported to be the best against E. coli, Klebsiella spp. and Proteus spp. When different group of antimicrobial agents used against six different spp. of bacteria isolated from 200 cases of UTI and also reported that these strains were most found resistant to Ampicillin.

In spit of all new antibiotics still certain bacteria are resistant to antibiotics which cause trouble to patients and difficulties in their recovery. Therefore this research is planned to compare the locally synthesized drugs-sensitivity of UTI pathogens in comparison with imported ones, particularly those of English source.

Materials and Methods

Bacterial strains

Three bacterial species were tested: E. coli, Klebsiella spp. and Proteus spp. One hundred strains of each have been isolated from patients with UTI during the period of (2014-2015) which admitted to Al-Yarmok hospital, Baghdad, department of Bacteriology.

Antibiotic-sensitivity assay

All the isolates of E .coli, Klebsiella spp. and Proteus spp. strains were tested for sensitivity to various antibiotics. The sensitivity of bacteria to an antibiotics is demonstrated by a significant zone of inhibition around the disc, the technique was performed according to the single disc technique (Bauer et al., 1966). The antibiotics were used in the following concentration: Ampicillin (Am 25 μg/ ml), Cephotoxim(CTX 10 μg/ ml) Gentamicin (GM10 μg/ ml), Nalidixic acid (NA 30 μg/ml) and Nitrofurantoin (NI 30 μg /ml)

Results and Discussion

In hospitals different types of antibiotics are used, the commonest one are Iraqi and English, the action of both types of antibiotics have been studied on 300 strains of E. coli, Klebsiella spp., Proteus spp. as shown in (Table 1) in terms of sensitivity test. This table shows the selected England-
manufactured antibiotics, which are used to applied routinely in sensitivity test in order to treat UTIs. This table reveals that (NI) is the best antibiotics against E. coli strains and Kelbsiella. spp. isolated from UTIs (80%, 70% respectively), while (GM) is the drug of choice against Proteus spp. (80%).

The action of Iraqi antibiotics on the same strains of bacteria was listed in (Table 2). The above table reveals that the efficiency of all these antibiotics was comparable to that for England-manufactured ones. However, the frequency of sensitive strains are low in comparison with that for English ones, though (NI) shows the highest frequencies of sensitivity as well as the English antibiotics.

This study demonstrated that our products of antibiotics almost efficient as well as the English ones. This fact was demonstrated in figure 1. below.

Urinary tract infections (UTIs) have complex dynamics, with uropathogenic Escherichia coli (UPEC), the major causative agent, capable of colonization from the urethra to the kidneys in both extracellular and intracellular niches while also producing chronic persistent infections and frequent recurrent disease. UTIs remain a common problem in inpatient care. They are highly challenging to provide effective initial therapy without sensitivity data. The present study showed that the action of (NA) against E. coli and proteus spp. agree with other investigators who reported that E. coli and Proteus spp. which were isolated from children with UTI, were sensitive to nalidixic acid.

The results of the current study are comparable with those of other study that Gentamicin was active against Proteus spp. which were isolated from various clinical conditions.

The Iraqi antibiotics showed various activities against different strains as shown in Table 2. These findings are in agreement with other (Lode, 1975) about the sensitivity of Proteus to Gentamicin.

Table 1: Sensitivity tests’ results among UTIs cases using English Antibiotics

| Organism       | No. of strains tested | Frequency of Sensitive strains (% of sensitive stains) |
|----------------|-----------------------|------------------------------------------------------|
|                |                       | Am (25 μg/ml) | CTX (10 μg/ml) | GM (10 μg/ml) | NA (30 μg/ml) | NI (30 μg/ml) |
| E. coli        | 100                   | 40           | 70            | 75           | 63           | 80           |
| Kebsiella spp  | 100                   | 48           | 55            | 57           | 60           | 70           |
| Proteus spp    | 100                   | 65           | 78            | 80           | 55           | 75           |

Table 2: Sensitivity tests’ results among UTIs cases using Iraqi Antibiotics

| Organism       | No. of strains tested | Frequency of Sensitive strains (% of sensitive stains) |
|----------------|-----------------------|------------------------------------------------------|
|                |                       | Am (25 μg/ml) | CTX (10 μg/ml) | GM (10 μg/ml) | NA (30 μg/ml) | NI (30 μg/ml) |
| E. coli        | 100                   | 32           | 65            | 68           | 70           | 75           |
| Kebsiella spp  | 100                   | 39           | 40            | 45           | 55           | 64           |
| Proteus spp    | 100                   | 55           | 80            | 76           | 42           | 71           |
Fig.1 Comparison of Inhibitory Sensitivity test frequencies of Iraqi Antibiotics with English one

![Histogram of Inhibitory Sensitivity Test Frequencies]

On the contrary, the results of other investigators who, denoted that (90%) of *E. coli* were inhibited by Ampicillin, meanwhile the current study indicated to (32%) only which inhibited by Iraqi Ampicillin (Stratford, 1984). This variation is related to continuous mutations among bacterial strains which results in huge No. of resistant strains.

Furthermore the over-dosage or low-dose consuming of antibiotics beside prolong treatment with ampicillin during the last 20 years enhance the development of different bacterial virulence methods for resistance of antibiotic particularly Ampicillin and especially in Iraq. The highest resistant of *E. coli* and *Klebsiella* spp. against Ampicillin in other study were in agreement with the present study (Sharma *et al.*, 2004).

Scientists declared that more than (50%) of urinary tract isolated *E. coli* are resistant to Ampicillin. Other investigators conducted a twelve month study in 11 children hospitals urinary isolates, they observed that (65%) strains of *E. coli* were resistant to Ampicillin, (4.2%) to Gentamicin and (4.3%) to Nitro-furatoxin which agree with this study's result.

Another study included 209 patients with UTI, which indicated to *E. coli* and *Klebsiella pneumoniae* as the most common isolates and (46%) of these strains are sensitive to Nalidixic acid (3). Furthermore, it was observed that (>90%) of *Proteus* spp isolates are sensitive to Nalidixic acid as well as the results of the current study (Huang *et al.*, 1968).
Regarding the effect of Gentamicin against *Proteus* spp. the result of the present study was compatible with other studies which showed that this bacterium; which isolated from UTI patients, is highly sensitive to Gentamicin (Shiba et al., 1971).

It was reported that more than (50%) of UTI isolates were sensitive to Gentamicin and Nitrofurantoin as in the current study (11). Nitrofurantoin was observed to be the most effective drug not only for *E. coli* (90%) but also for all the isolates (James et al., 2011) as in the current study.

From the general view, the English antibiotics against various bacteria were comparable to the Iraqi one in its action and this is because the Iraqi manufacturers during the last years; became more expert and skilled in antibiotics synthesis with high controls' parameters. Moreover they depended on the local strains for evaluation of their antibiotics products.

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