Antimicrobial Resistance in Gram-negative Bacilli Isolated from Urinary Tracts Infections

Short Communication

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Summary

From Mar 2000 to Nov 2001 the prevalence of resistance to ampicillin, sulfomethaxazol-trimetoprim, (SXT) nitrofurantoin, nalidixic acid, ciprofloxacin, cephalothin, and gentamicin in 740 gram-negative bacilli isolated from outpatients with acute urinary tract infections (UTIs) at Kashan Central Laboratory was prospectively evaluated. *Eschericia coli* (*E.coli*) (75%) was the most common causing UTIs, followed by Klebsiella spp. (17%) and Proteus spp. (2.1%). Among them 80% more isolates were resistance to ampicillin and 47% more isolates to SXT. Cephalothin resistance among *E.coli* isolates was >28%, Klebsiella spp 32.1% and Proteus spp. 40%. Overall, the rate of ciprofloxacin resistance among them was 7.8 to 18.2%. Nalidixic acid resistance among *E.coli* isolates was 6.5%, Klebsiella spp 9.7% and Proteus spp 15%. Among the isolates, 15% less isolates were resistance to gentamicin. Nitrofurantoin showed the lowest resistance rates (<4.5%) with exception of the Proteus spp. (10%). The high prevalence of resistance is surprising, it may reflect the widespread use of antibiotics in Kashan continued regional, and national surveillance is warranted.

Keywords: urinary tract infections, gram-negative bacilli, antimicrobial resistance

Introduction

Urinary tract infection is the most common cause of nosocomial infections in patients hospitalized in chronic care facilities. The changing resistance requires

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continuous monitoring to provide crucial information to guide empirical therapy and encourage prudent use of antibiotic (Lee *et al* 2003). In the community and hospital settings the aethiology of urinary tract infections (UTIs) and the antimicrobial susceptibility of urinary pathogens have been changing over the years. Factors such as the changing patient population, extensive use and misuse of antimicrobial drugs, could all contribute to changes in the microbial profile of urinary tract isolates (Gales *et al* 2000). Worldwide surveillance of antimicrobial resistance among urinary tract pathogens is useful to determin important trends and geographical variation for common gram-positive and gram-negative species. The most common causative uropathogens often have intrinsic or acquired resistance mechanism, which include ESBL production among enteric bacilli (Turindge *et al* 2002). Resistance to sulfamethoxazole-trimethoprim (SXT) is generally associated with resistance to additional drugs, often to ampicillin, cephalothin, and tetracyclines, and multidrug resistance may be transferred on a single plasmid (Gupta *et al* 2001). Resistance to wide range of antimicrobials in strains of *E.coli* isolated from urine specimens of outpatients is also increasing (Stamm 2001, Gupta *et al* 1999a and 1999b, McDonald *et al* 2001). As the pattern of bacterial resistance is constantly changing, monitoring of antimicrobial susceptibility is important. It provides information on the pathogenic bacteria isolated from patients, and assists in choosing the most empirical antimicrobial therapy. In addition, continuous surveys of antimicrobial resistance are crucial for monitoring changes in this resistance.

In this study we analyze the antimicrobial resistance patterns of bacteria isolated from urine specimens examined during March 2000 to November 2001 at Kashan Central Laboratory (KCL).

Materials and Methods

Specimen. During 18 months (March 2000 to November 2001) Microbiology department of KCL, Kashan University of Medical Sciences was received 5580

urine specimens of patients with UTIs. The samples were cultured and isolated bacteria identified by standard methods (Cowan & Steel 1993). The identified bacteria were examined for antimicrobial susceptibility pattern. Among them, those with significant growth were studied (significant growth was defined as the presence of >100,000 colony-forming per milliliter of urine). Antimicrobial susceptibility test was performed on the isolates by the disk diffusion method against antimicrobials commonly used for treatment of UTIs in Iran, according to standards developed by the National Committee for Clinical Laboratory Standard (1999). These antimicrobials were including ampicillin, SXT, ciprofloxacin, cephalothin, gentamicin, nalidixic acid, and nitrofurantoin. SPSS for windows (release 11, SPSS) to perform analysis of clinical data was used.

Results and Discussion

The total number of urine samples that showing significant growth was 971 (17.4%). 740 (76.2%) out of them were gram-negative and 231 (23.8%) gram-positive organisms. The species distribution of isolates was as follow: *E.coli* 555 (57.2%), Klebsiella spp. 165 (17%), Proteus spp. 20 (2.1%), *Staphylococcus aureus* 97 (10%), coagulase negative staphylococcus 49 (5.1%), and Streptococcus group 85 (8.7%). Among the gram-negative bacteria, *E.coli* was the most frequently isolated organisms (75%). The overall rates of resistance for the 740 gram-negative bacilli isolates analyzed are provided in Table 1. Of the *E.coli* tested, nitrofurantoin (1%) and gentamicin (5.4%) demonstrated lowest rates of resistance, and ampicillin (91.7%) demonstrated the highest rate. In the present study *E.coli* was the most frequently isolated bacterium (57.2%). The overall resistance rate of isolated *E.coli* to ampicillin was 91.7%. In other study 72% of the isolated *E.coli* from urine were resistant to ampicillin (Tavakoli 1998). The overall rate of resistance to ampicillin found in this study was significant and higher than rates reported by others (Gales *et al* 2000, Sahm *et al* 2001).

Table 1. *Antimicrobial resistance rates among urinary tract isolates of gram-negative bacteria at Kashan Central Laboratory in 2000-2001*

Bacteria	No.of isolate	AMP%	SXT%	NIT%	NAL%	CIP%	CTN%	GEN%
E.coli	555	91.7	47.9	1	6.5	14.1	28.9	5.4
Klebsiella pp.	165	90.3	47.3	4.3	9.7	7.8	32.1	10.3
Proteus pp.	20	80	55	10	15	18.2	40	15

AMP=Ampicillin, SXT=Trimethoprim-Sulfamethoxazol, NIT=Nitrofurantoin, NAL=Nalidixic acid, CIP=Ciprofloxacin, CTN=Cephalothin, GEN=Gentamicin

The emergence of resistance to SXT among urinary tract isolates in this area is not surprising, since it has been reported in several countries such as USA, Southern Europe, and Bangladesh (Stamm 2001). The resistance rates to ciprofloxacin and cephalothin were higher than reported rates in previous studies (Sahm *et al* 2001). Nitrofurantoin showed lowest resistance rate with exception of the Proteus spp., which was lower than other reports (Gales *et al* 2000, Tavakoli 1998), and similar to reported rate by Sahm *et al* (2001). Resistance to gentamicin was lower (<15%) than reported in previous Latin America surveillance study (Turindge *et al* 2002). Resistance to these antimicrobial agents is likely to be related to their widespread and unreasonable use. Prudent use of these antimicrobial agents in advised, to prevent or minimize the development of resistant strains.

The results of this study had revealed high rates of antimicrobial resistance among many of the gram-negative organisms isolated from urine specimens examined with the most significant findings being high to ampicillin, SXT, cephalothin and ciprofloxacin among *E.coli* strains. To address the problem of increasing antimicrobial resistance, which is becoming serious worldwide (Stamm 2001), antimicrobial surveillance programs are necessary both locally and nationally. Antimicrobial susceptibility surveys from different areas will allow comparisons at the national level. Collectively, antimicrobial susceptibility data derived from microbiology laboratories all over the Iran could be used for the reliable and rapid

detection and survellance of antimicrobial resistance, especially if these data are stored in some form of computerized laboratory information system.

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