SUSCEPTIBILITY OF *Escherichia coli* ISOLATED FROM BLOOD STREAM

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Accepted for publication: June 16, 2008

ABSTRACT

Hasan M. N., Mahal M. J., Mou S. M., Shamim Kabir A.H.M. and Islam M. J. 2008. *Susceptibility of Escherichia coli Isolated from Blood Stream.* **j. innov.dev.strategy 2(2): 34-37**

The prospective study was conducted in IBN SINA Diagnostics and Imaging center, Dhaka, Bangladesh during May 2007 to May 2008. To ensure appropriate treatment, knowledge of the organisms that cause specific infection and their antibiotic susceptibility is mandatory. In the present study, 40 isolates of *E.coli* were analyzed in term of antibiotic susceptibility. Result of antimicrobial susceptibility test reveals that all of the isolates were sensitive to Cotrimoxazole (30.0%), Ciprofloxacin (20.0%), Nalidixic acid (10.0%), Ceftriaxone (30.0%), Chloramphenicol (70.0%), Cefuroxime (10.0%), Imepenem (100.0%), Cefixime (70.0%). Multi-drug resistance pattern was observed in 90% of the isolates. 30% isolates were resistant to 8 antibiotics, 40% isolates were resistant to 6 antibiotics, 10% isolates were found to resist 4 antibiotics and 10% isolates were found resistant to 3 antibiotics. Our study concludes that there is a trend towards an increase in resistance to fluoroquinolones in the common gram-negative bacteria. Imipenem is the most active agent against gram-negative bacteria (*Escherichia coli*).The results of the susceptibility of *Escherichia coli* causing bacteremia provide valuable information for implementing the appropriate chemotherapy for bacteremia.

Keywords: *Escherichia coli*, multidrug resistant, susceptibility

INTRODUCTION

Bloodstream infections cause significant morbidity and mortality, with up to one-fourth of affected patients dying as a result of their infection (Weinstein *et al.*, 1997; Wenzel *et al.*, 2001; Diekema *et al.*, 2003; Edmond *et al.*, 1999, Pittet *et al.*, 1997; Weinstein *et al.*, 1983). Early acceptance of appropriate antimicrobial therapy has been demonstrated to improve the outcome of bloodstream infection (Bryant *et al.*, 1971; Kollef *et al.*, 1999). Timely and accurate detection and reporting of bloodstream infection are therefore some of the most important functions of a clinical microbiology laboratory (Cunney *et al.*, 2000; Cunney and Smith, 2000; Doern *et al.*, 1982, Peterson *et al.*, 2001). In addition, antimicrobial susceptibility test (AST) results can affect both the clinician's choice of antimicrobial therapy and the patient's outcome. If the laboratory reports results that are erroneous, patients with bloodstream infection may not receive optimal therapy. In addition, reporting all AST results for an organism, rather than reporting selectively (e.g., "cascading," or only reporting the narrowest-spectrum agents to which the organism is susceptible), may encourage inappropriate antibiotic use. Thus, prompt detection of bloodstream infection, accurate microbial identification and susceptibility testing, and appropriate reporting of results are important patient safety issues. *E. coli* is the most common cause of infections by gram-negative bacilli (Diekema *et al.*, 2003) and the bacterial organism most often isolated from blood cultures (Fluit *et al.*, 2000; Vazquez *et al.*, 1992; Lark *et al.*, 2001). It is a frequent cause of outpatient urinary tract infections in women worldwide, of hospitalization due to pyelonephritis and septicemia, and of nosocomial infections among hospitalized patients. Meningitis caused by *E. coli* in neonates is frequently fatal. Resistance to recommended first- and second- line agents, such as penicillins, cephalosporins, sulfa drugs (Diekema *et al.*, 1999; Fluit *et al.*, 2000; Sahm *et al.*, 2000), and fluoroquinolones (Garau *et al.*, 1999; Goettsch *et al.*, 2000) is high in many countries and is commonly associated with treatment failure.

MATERIALS AND METHODS

Isolation and Identification of pathogens

A total of 200 blood samples from inpatients with fever/sepsis submitted to the department of Microbiology, IBN SINA hospital pvt. Ltd and Diagnostics & Imaging center, Dhaka, Bangladesh from May 2007 to May 2008 were processed for culture, and 40 of these samples yielded bacterial isolates. Under the appropriate a septic precautions, 5-10ml of blood was drawn by venipuncture and inoculated into two culture bottles each containing 50ml of 0.5% vile-broth and 50ml of 0.5% glucose broth. After overnight incubation at 37^0c, subculture was made onto McConkey agar and blood agar, Eousine Methylene blue agar. The isolate obtained was further processed as per the standard procedures to identify the pathogen (Garcia *et al.*, 2004).

Antimicrobial susceptibility test

The antibiotic susceptibility of blood isolates was determined by the disc diffusion NCCLS method (2003). The antibiotics tested against are penicillin; amoxicillin, cephalosporin; ceftreaxone, cefuroxime, cefixime, Fluoroquinolones; ciprofloxacin, Phenicol; chloramphenicol, sulfonamides; cotrimoxazole, Nalidixic acid and Imepenem.All culture-media and antibiotics discs were obtained from Hi-meida Laboratories, Mumbai, India.

RESULTS AND DISCUSSION

Result of antimicrobial susceptibility test reveals that all of the isolates were sensitive to Cotrimoxazole (30.0%), Ciprofloxacin (20.0%), Nalidixic acid (10.0%), Ceftriaxone (30.0%), Chloramphenicol (70.0%), Cefuroxime (10.0%), Imepenem (100.0%), Cefixime (70.0%). Multi-drug resistance pattern was observed in 90% of the isolates. Twelve isolate were resistant to 8 antibiotics, sixteen isolates were resistant to 6 antibiotics, four isolates were found to resist 4 antibiotics and another four isolates were found resistant to 3 antibiotics.

Table 1. Results of antimicrobial susceptibility test

Types of antibiotics	Sensitive	Resistant
1. Amoxicillin (30µg)	0 0(00.0%)	40(100.0%)
2. Cotrimoxazole(30µg)	12(30.0%)	28(70.0%)
3. Ciprofloxacin(5µg)	08(20.0%)	32(80.0%)
4. Nalidixic acid(30µg)	04(10.0%)	36(90.0%)
5. Ceftriaxone(15µg)	12(30.0%)	28 (70.0%)S
6. Chloramphenicol(30µg)	28(70.0%)	28(70.0%)
7. Cefuroxime(30µg)	04(10.0%)	12(30.0%)
8. Imepenem(10µg)	40(100.0%)	0(00.0%)
9. Cefixime(30µg)	28(70.0%)	12(30.0%)

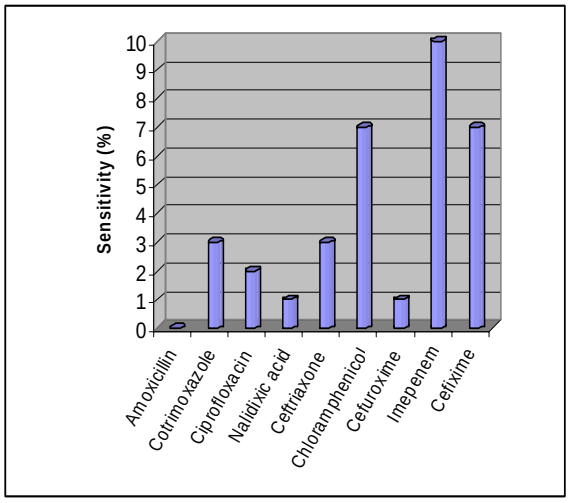

Figure 1. Antimicrobial susceptibility of *Escherichia coli* isolates

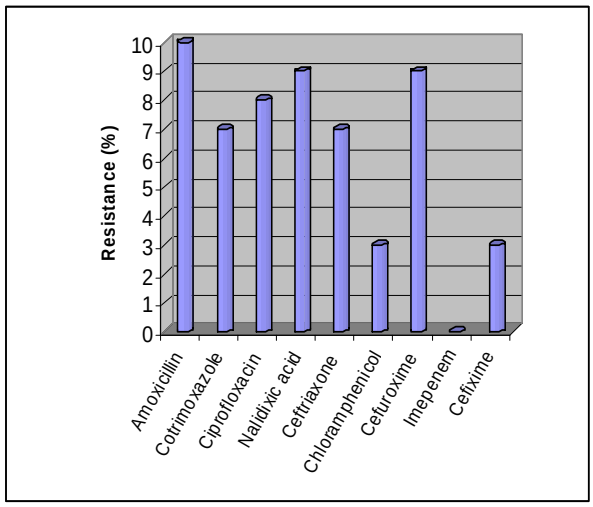

Figure 2. Antibiotics resistance pattern of *Escherichia coli* isolates.

The use of antibiotics in the treatment and prevention of infectious diseases is clearly a necessity, however much care must be given to the choice of antimicrobial agents to be used. (Foxman *et al.*, 2000; Foxman, 2002). Unfortunately isolates of *Escherichia coli* are becoming increasingly resistant to commonly used fluoroquinolones. Moreover, in patients with suspected Escherichia coli infection, antibiotic treatment is usually started empirically, before culture results are available. To ensure appropriate treatment, knowledge of the organisms that cause specific infection and their antibiotic susceptibility is mandatory (Shao *et al.*, 2003; Iqbal *et al.*, 1997). In the present study, 40 isolates of *E.coli* were analyzed in term of antibiotic susceptibility. In this study, 80% of *E.coli* isolates were resistant to ciprofloxacin and 90% to nalidixic acid. Moreover this study shows generalized decrease in bacterial susceptibility of *E. coli* to common fluoroquinolones. It could be concluded empirically that use of fluoroquinolones

in blind cases reduces the susceptibility of *Escherichia coli.* The persistent decrease in sensitivity of *E. coli* to fluoroquinolones is worrying, because these antibiotics have proven very effective for the treatment of infection in both, hospitalized and outpatients (Weber *et al.*, 1997). Comparison of our results with findings from previous studies in different countries showed higher resistance. For example in Turkey, the incidence of resistance of *E. coli* to quinolones increased from 6.4% in 2003 to 21% in 2000 (Ferhat and Cibali, 2004). Similar findings have been reported in other countries. For example in the year 2003 in Kuwait the extent of resistance was 17.8% (Dimitriv *et al.*, 2004) and in Gaza stripe in the year of 2005 it was 17.5%. Our study concludes that there is a trend towards an increase in resistance to fluoroquinolones in the common gram-negative bacteria. Imipenem is the most active agent against gram-negative bacteria (*Escherichia coli*).The results of the susceptibility of *Escherichia coli* causing bacteremia provide valuable information for implementing the appropriate chemotherapy for bacteremia.

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