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Prevalence and current antibiogram trend of bacterial isolates of urinary tract infections in outpatients at Helping Hands Community Hospital, Kathmandu, Nepal

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ABSTRACT

Objective: To ascertain the prevalence and antibiotic susceptibility pattern of bacteria from urinary tract infections.
Methods: A retrospective analysis of bacterial pathogens and antibiogram was done in Helping Hands Community Hospital Laboratory from August to November, 2014.
Results: The prevalence of bacterial isolates was higher among females (44.70%) than males (31.34%) ($P < 0.001$). The most common bacteria were *Escherichia coli* 35 (59.32%), followed by coagulase-negative *Staphylococcus* 5 (8.47%), *Salmonella enterica* 4 (6.78%), *Proteus mirabilis* 2 (3.39%), *Proteus vulgaris* 2 (3.39%), *Klebsiella pneumoniae* 2 (3.39%), *Salmonella typhi* 2 (3.39%), *Pseudomonas* species 2 (3.39%), *Staphylococcus aureus* 2 (3.39%), *Citrobacter* species 2 (3.39%), *Acinetobacter baumannii* 1 (1.69%), *Acinetobacter* species 1 (1.69%), *Proteus vulgaris* 1 (1.69%).
Conclusions: Most Gram-positive isolates were sensitive to nitrofurantoin, gentamycin and norfloxacin, and they are considered as appropriate microbials for empirical treatment of urinary tract infections.

1. Introduction

The persistent presence of actively multiplying microorganisms within the urinary tract is known as urinary tract infections (UTIs. UTIs are very common in both hospitals and community settings[1]. Worldwide, approximately 150 million people are diagnosed with UTIs[2]. The urine culture is positive (105 colony-forming units/mL of a single bacterial species) from patients with symptoms associated with UTIs, whereas symptomless bacteriuria was defined as a affirmative urine culture from patients without any change in body function associated with UTIs[2]. Gram-negative bacteria such as *Pseudomonas aeruginosa*, *Escherichia coli* (*E. coli*), *Klebsiella* species, *Proteus mirabilis*, *Serratia* and *Acinetobacter* species cause most of the UTIs, and Gram-positive bacteria such as *Enterococcus* species and *Staphylococcus* species do as well[3,4]. Knowledge of the locality of bacterial etiology and susceptibility patterns is required to trace changes that might have happen in time so that modified recommendation for optimal empirical therapy of UTIs can be made[5]. *E. coli* is most responsible to UTIs[6,7]. *E. coli*, the commonest causative agent of the family Enterobacteriaceae, accounting for 75.0%–90.0% of all UTIs in inmates and outpatients[8]. UTI is a common disease ailment among Nepalese and it is also one of the commonest nosocomial infection. According to the annual report of Nepal in year 2010/2011, which was published by the Department of Health Services, the morbidity of UTIs among outpatients were 265 143. The present study was carried on to determine the prevalence and susceptibility pattern of *E. coli* associated UTI among outpatients.

2. Materials and methods

2.1. Study design

A prospective examination of culture results of urine was performed at Helping Hands Community Hospital Laboratory from April 2014 to August 2014. The sex and age of patients,

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the organism isolated and the antimicrobial susceptibility profiles were collected from the culture plate records using a standard data collection form. The data were entered into Excel for analysis.

2.2. Culture and identification

Clean-catch midstream morning urine samples were collected using sterile wide mouth glass container. Urine samples were plated on MacConkey agar, cystine lactose electrolyte-deficient medium and blood agar (Oxoid, Basingstoke, UK) using calibrated wire loops and then incubated aerobically at 37 °C for 18–24 h. From positive cultures, uropathogens were identified followed to the standard operational procedures as per the standard microbiological methods[6]. A significant bacterium was considered if urine culture yield 105 colony-forming units/mL in the culture[9]. The positive culture was identified by colony characteristics, Gram staining and biochemical tests using standard bacteriological methods and further processed for standard antibiotic susceptibility tested by Kirby-Bauer method as per Clinical and Laboratory Standards Institute guidelines.

2.3. Antimicrobial susceptibility test

Standard operational procedures were followed. Antimicrobial susceptibility tests were done on cystine lactose electrolyte-deficient medium by using Kirby-Bauer disk diffusion method[10]. The antimicrobial agents tested were nitrofurantoin (30 μg), amikacin, ciprofloxacin (30 μg), nalidaxic acid, gentamicin (120 μg), norfloxacin (10 μg), cotrimoxazole and cefexime. Resistance were interpreted as per Clinical and Laboratory Standard Institute guidelines. Antibiotic discs used were from Hi-Media Laboratories, India.

2.4. Data analysis

Data were entered into Microsoft Excel and analysed by SPSS version 16.0 program. $P < 0.05$ was considered to indicate statistically significant difference.

2.5. Ethical considerations

The study protocol was performed according to the Helsinki declaration and approved by Ethical Review Committee of Helping Hands Community Hospital. Informed written consent was obtained from the patients involved in this study.

3. Results

A total of 152 urine samples from suspected UTIs were analyzed for isolation and identification of bacteria and antimicrobial susceptibility testing. Among those samples, 59 (38.81%) gave

significant bacterial growth (Figire 1). The majority of bacteria were Gram-negative (52, 88.14%) and the other 7 (11.86) were Gram-positive. The prevalence of bacterial isolates was higher among females (44.70%) than males (31.34%) ($P < 0.001$). The most common isolated bacteria were *E. coli* (35, 59.32%), followed by coagulase negative *Staphylococcus* (CONS) (5, 8.47%), *Salmonella enterica* (4, 6.78%), *Proteus mirabilis* (2, 3.39%), *Proteus vulgaris* (2, 3.39%), *Klebsiella pneumoniae* (2, 3.39%), *Salmonella typhi* (2, 3.39%), *Pseudomonas* species (2, 3.39%), *Staphylococcus aureus* (2, 3.39%), *Citrobacter* species (2, 3.39%), *Acinetobacter baumannii* (1, 1.69%), *Acinetobacter* species (1, 1.69%), *Proteus vulgaris* (1, 1.69%). The frequency of bacterial isolates was in range from 8 to 72 years with most values at the low end. The median age of bacterial isolates for women was 30 years, and for men was 59 years. The most predominant organism, *E. coli*, was found to be highly sensitive to nitrofurantoin (97.41%) followed by gentamicin (88.57%), norfloxacin (80.00%) and was resistance to nalidixic acid (71.42%) and amoxycillin (80.00%) (Figure 2). Gram-positive bacterial isolates were 100% sensitive to gentamicin and nitrofurantoin. Other Gram-negative bacterial isolates were mostly sensitive to gentamicin. A majority of bacteria were resistant to commonly used antibiotics.
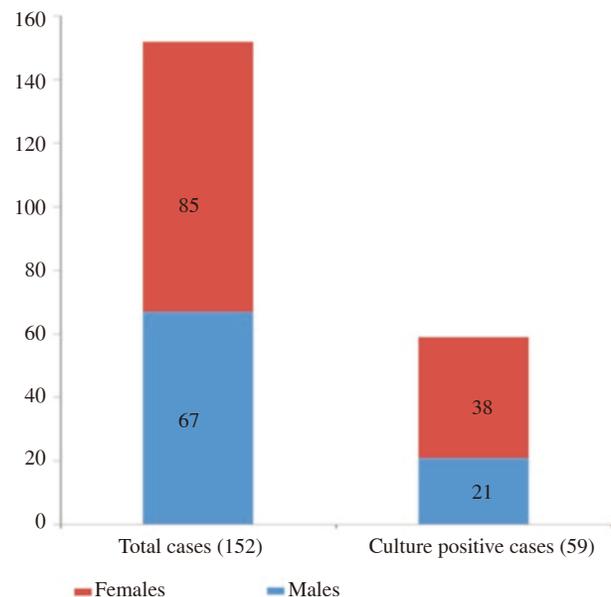
Figure 1. Total cases with culture positive of male and female patients.
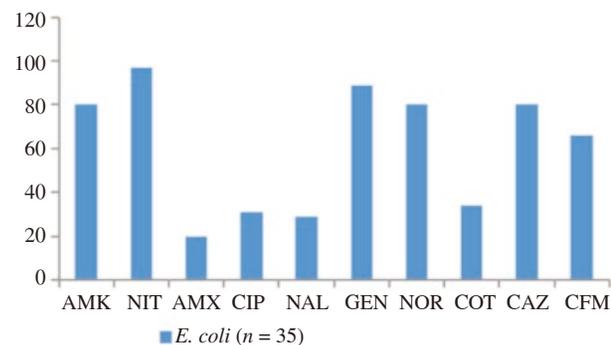
Figure 2. *E. coli* sensitivity test in percentage.
AMK: Amikacin; NIT: Nitrofurantoin; AMX: Amoxycillin; CIP: Ciprofloxacin; NAL: Nalidixic acid; GEN: Gentamicin; NOR: Norfloxacin; COT: Cotrimoxazole; CAZ: Ceftazidime; CFM: Cefuroxime.

4. Discussion

UTIs are common diseases diagnosed worldwide. The availability of new antimicrobials has improved the management of UTIs. Effective management of patients suffering from bacterial UTIs commonly relays on the identification of the causative organism and the selection of proper antibiotic. This often causes difficulties for the treatment of UTI patients and accidentally high health care costs. For this reason, our study is especially meaningful and provides potential information about recent urinary pathogens distribution and their antibiotic susceptibility pattern. The overall isolation rate of uropathogens in this study was 38.81% which is relatively higher than the rates reported in India[11-14].

The age group calculation showed that the female patients in the range of 20–30 years had the highest prevalence rate (48.84%) and this might be due to the reason that female in the reproductive age groups had high prevalence rate of UTI and similarly the relative incidence of symptomatic UTI was high in sexually active young women[14]. The most common isolated bacteria were *E. coli* (35, 59.32%), followed by CONS (5, 8.47%), *Salmonella enterica* (4, 6.78%), *Proteus mirabilis* (2, 3.39%), *Proteus vulgaris* (2, 3.39%), *Klebsiella pneumoniae* (2, 3.39%), *Salmonella typhi* (2, 3.39%), *Pseudomonas* species (2, 3.39%), *Staphylococcus aureus* (2, 3.39%), *Citrobacter* species (2, 3.39%), *Acinetobacter baumannii* (1, 1.69%), *Acinetobacter* species (1, 1.69%), *Proteus vulgaris* (1, 1.69%). The isolation rates of *E. coli* and other pathogens in this study were corresponding comparable to the rates documented previously[4,12,15].

Most Gram-positive isolates were sensitive to nitrofurantoin, gentamycin and norfloxacin, and they are considered as appropriate microbials for empirical treatment of UTIs.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

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