Changing Trends in Antibiotic Resistance of Organism from Urinary Tract Infections Over Five Years in VIMS Ballari, Karnataka, India

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ABSTRACT

The aim of the present study was to examine the changes in the trend of antibiotic resistance of organisms from urinary tract infection over a five-year period in our hospital. The data selected were all urine cultures from the hospital urine samples over a five-year period. Results of urine cultures from patients throughout the hospital were analysed and information on susceptibility to four antibiotics i.e., Gentamycin, Amikacin, Ciprofloxacin and Nitrofurantoin was collected. Total number of urine samples in the study period were 15949, out of which 5690 (35.67%) showed the growth of bacteria with significant count. E. coli was the commonest organism isolated followed by Klebsiella spp., Pseudomonas, S. aureus and others. Ciprofloxacin resistance has been increasing since past five years (2012 -33% and 2016-40%), and even gentamycin resistance has increased since past five years in (2012-31% and 2016-33%) also statistically amikacin show rise in resistance pattern (2012-31% compared to 2016-36%). As resistance to nitrofurantoin is less compared to other drugs i.e., (2012-14% and in 2016-17%). Nitrofurantoin resistance is low compared to other drugs. It is both cost effective and efficacious for empirical treatment of uncomplicated UTIs therefore should be considered the mainstay of treatment of uncomplicated UTIs. This can be switched to targeted therapy on the basis of definitive subsequent culture and AST results.

Keywords
Urinary tract infection, Antibiotic Resistance, Ciprofloxacin.

Introduction

Urinary tract infection [UTI] is one of the most common infections diagnosed in outpatient and in hospitalized patients (Vasudevan, 2014) worldwide about 150 million people are being diagnosed with urinary tract infection every year (Manikandan et al., 2011).

It is caused by gram positive and gram negative organisms (Alsamarai et al., 2016). Inappropriate use of antibiotics has led to increasing resistance rates in Gram negative bacteria against standard antibiotics with the increase rate of extended spectrum beta-lactamase in urinary organism, the treatment of UTIs has become more complex and more difficult (Alicem et al., 2012). The purpose of this study is to optimise outcomes which minimises excess broad-spectrum antimicrobial use, which can drive resistance selection pressures and be associated with secondary problems such as Clostridium difficile infection. It is important to continually monitor changes in antibiotic resistance.
susceptibility in order to ensure that treatment remain appropriate (Penelope et al.,).

Materials and Methods

The data selected were all urine cultures from the hospital urine samples over a five-year period i.e., 2012 to 2016.

Results of urine cultures from patients throughout the hospital were analysed and Information on susceptibility to four antibiotics i.e., Gentamycin, Amikacin, Ciprofloxacinc, Nitrofurantoin were collected.

Results and Discussion

Total number of urine samples in the study period were 15949, out of which 5690 (35.67%) showed the growth of bacteria with significant count. E. coli was the commonest organism isolated followed by Klebsiella spp, Pseudomonas, S. aureus and others (Figs. 1 and 2). Ciprofloxacinc resistance has been increasing since past five years (2012 -33% and 2016-40%) and even gentamycin resistance has increased since past five years in (2012-31% and 2016-33%) also statistically amikacin show rise in resistance pattern (2012-31% compared to 2016-36%), As resistance to Nitrofurantoin is less compared to other drugs i.e., (2012-14% and in 2016-17%).

UTIs are the most common bacterial infections among the community and hospital-acquired infections. In recent years, resistance rates to commonly used antibiotics increase rapidly and the treatment of UTIs has become more difficult (Alicem et al.,), ciprofloxacinc resistance has been increasing since past five years (2012: 33% and 2016: 40%), and even gentamycin resistance has increased since past five years in (2012: 31% and 2016: 33%) also statistically amikacin show rise in resistance pattern (2012: 31% compared to 2016: 36%). and resistance to Nitrofurantoin is less compared to other drugs (i.e., 2012-14% and in 2016-17%) (Fig. 3).

Nitrofurantoin is a broad-spectrum bactericidal antibiotic, and it is use for more than four decades no clinically significant resistance has developed, as seen with other commonly used antibiotics. This is probably because Nitrofurantoin has multiple sites and levels of action in contrast to antibiotics that attack a single target like ampicillin or two targets like cotrimoxazole.

Fig.1 Positive and negative culture of urine samples
Bacterial nitroreductase enzyme converts nitrofurantoin to highly reactive electrophilic intermediates which non-specifically attack bacterial ribosomal proteins resulting in complete inhibition of protein synthesis (McOsker et al., 1994), and cause single-strand breaks in DNA (McCALLA et al., 1970). Nitrofurantoin is usually well tolerated. Side-effects occur at rates <0.001%. Nitrofurantoin is active against most common uropathogens including *E. coli*, *Citrobacter* spp, *Staphylococcus* saprophyticus and *Enterococcus* spp. Whereas, *Enterobacter* spp. and *Klebsiella* spp. are only moderately inhibited, *Proteus* spp, *Providencia* spp, *Morganella morgannii*, *Serratia* sp, *Pseudomonas* spp, and *Acinetobacter* spp. are mostly resistant to nitrofurantoin (Ronald et al., 1967; Barry, 1990).

In conclusion nitrofurantoin resistance is low compared to other drugs. It is both cost effective and efficacious for empirical treatment of uncomplicated UTIs therefore should be considered the mainstay of treatment of uncomplicated UTIs, since most of the organism like *E. coli*, *Staphylococcus* are regularly isolated from urine samples. Nitrofurantoin can be an alternative antibiotic but to be used judiciously.

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