

Original Research Article

<http://dx.doi.org/10.20546/ijcmas.2016.508.074>

## Isolation and Antibiogram of *Enterococci* from Patients with Urinary Tract Infection in a Tertiary Care Hospital

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### ABSTRACT

#### Key words

*Enterococci*,  
UTI, Linezolid,  
Vancomycin  
Resistant  
*Enterococci*,  
Tigecycline,  
Teicoplanin.

#### Article Info

Accepted:  
25 July 2016  
Available Online:  
10 August 2016

*Enterococci* are implicated in blood stream infections (BSI), endocarditis, urinary tract infections (UTI), pyogenic infections, intra-abdominal and pelvic infections. The most common nosocomial infections produced by these organisms are urinary tract infections (associated with instrumentation and antimicrobial administration), followed by intra-abdominal and pelvic infections. The present study was conducted to analyse the changing patterns of antibiotic sensitivity to *Enterococci* in patients with urinary tract infection. It was a prospective study of one year duration where 1180 urine samples from patients with suspected UTI were analysed. Isolation of *Enterococci* was done by conventional methods and AST was done by Kirby Bauer Disc Diffusion method as per CLSI guidelines. Linezolid would be the best choice for treatment of complicated and multidrug resistant enterococcal infections. For vancomycin resistant *Enterococci*, tigecycline can be a good option. Teicoplanin can be used as a reserve drug for enterococcal infections. Azithromycin and Clindamycin have no therapeutic role in treatment of enterococcal infections and hence can be avoided while antibiotic susceptibility testing.

### Introduction

The genus *Enterococcus* consists of Gram-positive, facultatively anaerobic organisms that are ovoid in shape and may appear on smear in short chains, in pairs or as single cells. It forms an indigenous flora of the intestinal tract, oral cavity and the genitourinary tract of the humans and animals, are known to be relatively avirulent in healthy individuals, but have become important opportunistic pathogens, especially in hospitalized patients. *Enterococci* are implicated in blood stream

infections (BSI), endocarditis, urinary tract infections (UTI), pyogenic infections, intra-abdominal and pelvic infections (Murray *et al.*, 1990). The most common nosocomial infections produced by these organisms are urinary tract infections (associated with instrumentation and antimicrobial administration), followed by intra-abdominal and pelvic infections (Marothi *et al.*, 2005). A common regime for treatment of serious enterococcal infections is the combination of cell-wall inhibitors, such as

penicillin, ampicillin or vancomycin; with aminoglycosides, such as streptomycin or gentamicin. The addition of cell-wall inhibitor agent helps in the penetration of the aminoglycoside into the bacterial cytoplasm, making the intrinsically resistant organism aminoglycoside sensitive. Reduced susceptibility to vancomycin will interfere with the penetration of the aminoglycoside into the bacterial cytoplasm, thus making the synergism in effective (Herman *et al.*, 1991). It is imperative to analyse the pattern of susceptibility to newer drugs which may be effective to treat Vancomycin Resistant Enterococci. There is a huge dearth of information regarding the effect of Tigecycline and Teicoplanin on Enterococci. This study was undertaken to provide accurate antimicrobial resistance patterns for enterococci so that effective therapy can be initiated from cases of urinary tract infection.

## **Materials and Methods**

### **Study population, design and setting**

The present study was a prospective cross sectional study conducted in the department of Microbiology at Narayana Medical College, Nellore over a 1 year period from July 2015 to June 2016.

### **Inclusion Criteria**

- 1) Patients with symptoms of UTI
- 2) Patients from both Outpatient and Inpatient wards

### **Exclusion Criteria**

- 1) Patients on antibiotic therapy
- 2) Infants
- 3) Pregnant women

## **Sample collection**

Mid-stream urine sample in early morning was collected in wide mouth sterile container. Male patients were instructed to cleanse the glans penis with soap and water, dry the area, and collect the urine with foreskin retracted. Female patients were instructed to cleanse the area around the urethral opening with soap and water, dry the area, and collect the urine with the labia held apart.

## **Identification**

Urine samples were cultured over routine culture media; MacConkey agar and Cysteine lactose electrolyte deficient (CLED) agar with a sterile standard loop. These plates were incubated at 37°C for 2 consecutive days. Enterococci were identified on the basis of appearance on gram stain, growth in 6.5% NaCl, catalase-negative, growth on bile esculin medium. Bacitracin resistance and positive Voges-Proskauer test were also used for the confirmation of isolates as enterococci.

## **Antibiotic Susceptibility Testing**

Antimicrobial susceptibility testing and interpretation was carried out on Mueller-Hinton agar (HiMedia Laboratories, India) by standard disc diffusion method as per Clinical Laboratory Standards Institute (CLSI) guidelines using discs of standard concentration. Standard strains of *Staphylococcus aureus* ATCC 25923 and *E. faecalis* ATCC 29212 were used as controls.

The antibiotics tested were (concentration in µg) as follows: Ampicillin (10), Cefixime (5), Azithromycin (15), Ofloxacin(5), Gentamycin (30), Clindamycin (10), Amoxycylav (30), Piperacillin/Tazobactam

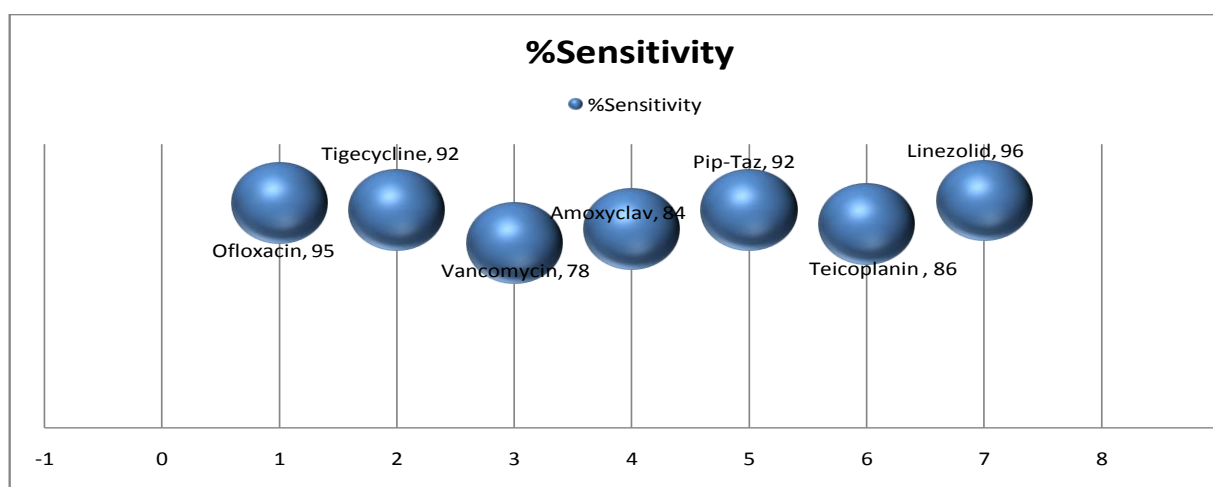
(100/10), Teicoplanin (30) Tigecycline (15), Vancomycin (30), and Linezolid (30). These discs were obtained from HiMedia laboratories, India.

**Results and Discussion**

A total of 1180 urine samples were studied from patients with suspected signs and symptoms of urinary tract infection, out of which 800 specimens were positive in

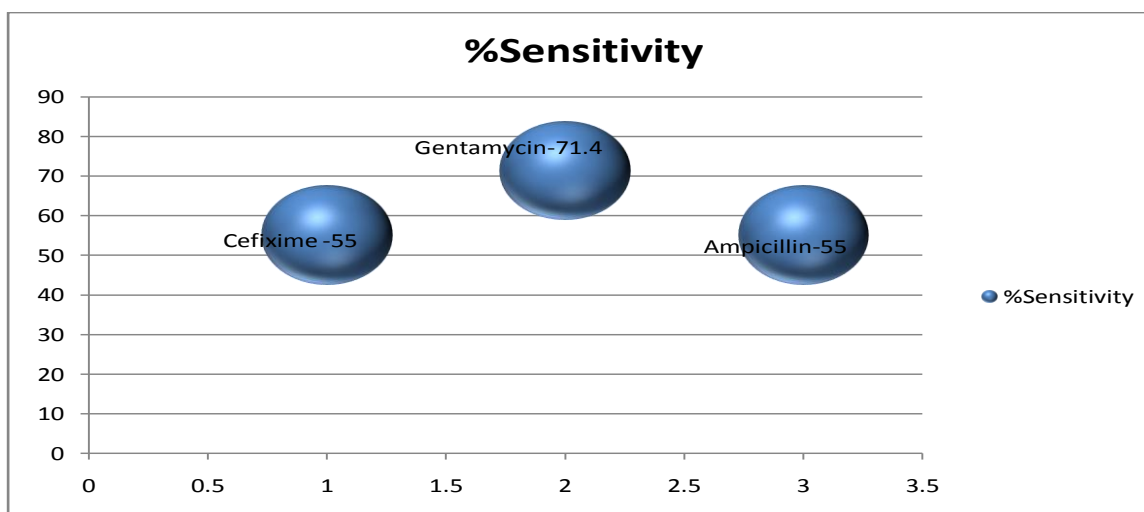
culture. *Enterococci* were isolated in pure cultures in 115 specimens. Speciation was not done. *Enterococci* were resistant to Azithromycin (88.9%) and Clindamycin (85.7%), sensitive to Ofloxacin(95%), Tigecycline (92%), Vancomycin (78%), Amoxyclav (84%), Piperacillin-Tazobactam (92%), Teicoplanin(86%) and Linezolid (96%). However the sensitivity to Gentamicin was 71.4% and Cefixime was 55% and Ampicillin was 55%.

**Fig.1**



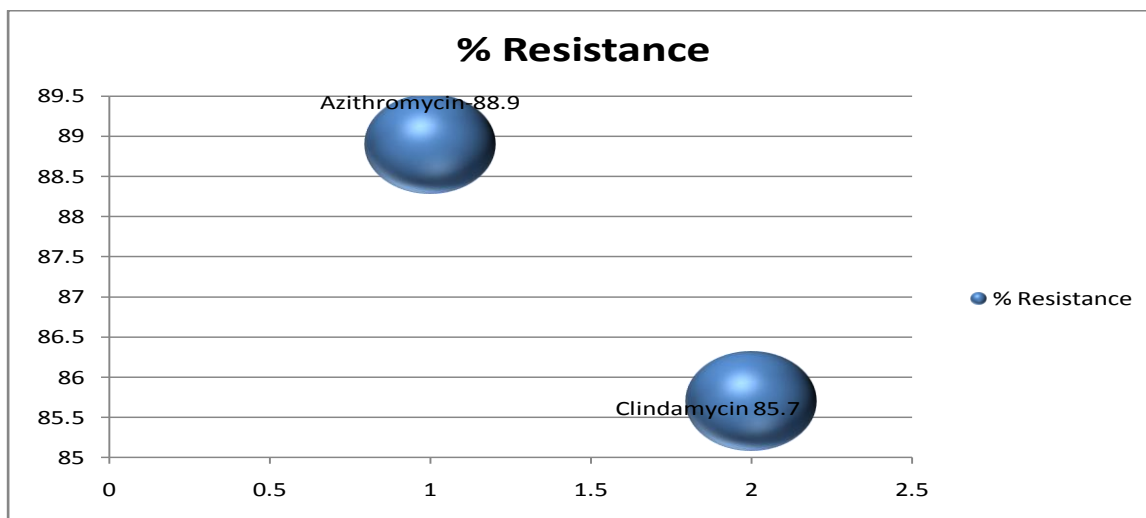
**FIG.1 ANTIMICROBIALS SHOWING SENSITIVITY PATTERN**

**Fig.2**



**Fig 2 Antimicrobials showing intermediate sensitivity**

**Fig.3**



**FIG 3. ANTIMICROBIALS SHOWING RESISTANCE PATTERN**

The ability to cause serious infections and the pattern of variable resistance to antibiotics has caused increased interest in enterococci in the recent past. In our study the sensitivity to Ampicillin was only 55% which is in correlation with Jain, *et al.*, (2011) and Tuhina, *et al.*, (2016). Linezolid would be the best drug and the susceptibility patterns were in correlation with Parameswarappa *et al.*, (2013).

We also found that Tigecycline susceptibility is far better than that of Vancomycin making it an alternative for VRE. Vancomycin susceptibility in our study correlated with the study of Gupta P *et al.*, (2015). However the degree of sensitivity to Tigecycline is less compared to that of Vidyalakshmi *et al.*, (2012) and Wattal *et al.*, (2010) where there is 100% sensitivity. This may be due to selection pressure as the drug is commonly used for complicated intra abdominal and skin infections in our hospital. Enterococci are susceptible to Ofloxacin in our study compared to Alam *et al.*, (2011). Enterococci are susceptible to teicoplanin. Azithromycin and Clindamycin are

ineffective to treat enterococcal infections. There is no emergence of aminoglycoside resistance in my area.

It is therapeutically challenging to treat enterococcal infections due to intrinsic and acquired resistance to vancomycin and production of  $\beta$ -lactamases. This creates a clamour to implement appropriate infection control measures to decrease the transmission of these microorganisms in hospital settings. Rational and restricted usage of antibiotics decrease the burden of selection pressure and an appropriate antibiogram helps in adequate empirical treatment options. Hence more studies should be conducted to know the diverse mechanisms of antimicrobial resistance patterns in enterococci across the globe.

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**How to cite this article:**

Siva Prasad Reddy Basava. 2016. Isolation and Antibiogram of *Enterococci* from Patients with Urinary Tract Infection in a Tertiary Care Hospital. *Int.J.Curr.Microbiol.App.Sci*. 5(8): 658-662. doi: <http://dx.doi.org/10.20546/ijcmas.2016.508.074>