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## RESEARCH ARTICLE

### RETROSPECTIVE STUDY OF BACTERIAL INFECTIOUS DISEASES AND ANTIBIOTIC SENSITIVITY PATTERN OF VARIOUS BACTERIAL ISOLATES FROM PATIENTS ATTENDING A TERTIARY CARE HOSPITAL; COIMBATORE TAMIL NADU

**\*Shreeram A Deshpande, Anbu. N. Aravazhi and Gnanaprakash, K**

Karpagam Faculty of Medical Sciences and Research (TN Dr. M.G.R. Medical University) Coimbatore, Tamil Nadu, India -641032

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#### ABSTRACT

The distribution of various bacterial isolates causing infectious diseases was evaluated in Karpagam Medical College Hospital, Othakkalmandapam, Coimbatore district, Tamilnadu. A total of 578 samples which included urine, pus, sputum, blood, eye swab, throat swab, ear swab, nasal swab, ascitic fluid, pleural fluid and C.S.F were analyzed. Out of total 578 samples analyzed in bacteriology laboratory, 216 were culture positive. The antibiotic susceptibility test of the bacterial isolate was performed by Kirby-Bauer disk diffusion method. Majority of the bacterial isolates showed wide resistance to the antimicrobials employed. High rate of multiple antibiotic resistances was observed in isolates from I.C.U and Surgery Departments.

#### INTRODUCTION

Infectious diseases remain an important cause of morbidity and mortality among humans, especially in developing countries. Various species of bacteria live on human skin, Gastrointestinal tracts, and are potential threats whenever immunity is compromised due to various diseases affecting defense system and ending in microbial infections. (Howard *et al.*, 1980) The infecting pathogens not only differ from country to country, but also vary from one hospital to another within the same country (Ongusola *et al.*, 1998). As described by WHO (1981), hospital acquired infections remain a serious health hazard worldwide. Despite advances in control of infection, various infections still persist due to problem of drug resistance (Thomas *et al.*, 1981). The widespread use of antibiotics, together with length of time over which they have been available, have led to major problem of resistant organisms contributing to morbidity and mortality (Elmer *et al.*, 1997). Knowledge of causative agents of various infections has proven to be useful in selection of appropriate antimicrobial therapy and on infection control measures taken in health institutions. (Adebayo *et al.*, 2003)

#### MATERIALS AND METHODS

This was a retrospective cross sectional study of various clinical samples over a period of 1 year from August 2013 to July 2014. A total of 578 samples from all clinical and surgical

departments admitted in Karpagam Faculty of Medical Sciences & Research, Othakkalmandapam, Coimbatore-32 formed the basis of this study. Details of the patient age, sex, diagnosis, date of surgery, preoperative stay, antibiotics taken preoperatively and post operatively, past history were noted as clinical history (Onche *et al.*, 2004). Patients with diabetes mellitus, obesity, carcinoma and patients on drugs such as steroids or cytotoxics were excluded (Howe *et al.*, 1954). Clinical samples were collected with the help of 2 sterile disposable cotton swabs (Ananthanarayan *et al.*, 2014). One swab was used to make smear for detection of pus cells and microorganisms (Howard *et al.*, 1980). Other swab was used to inoculate onto Blood agar and MacConkey agar media and incubated at 37<sup>o</sup>C for 24 hours (Koneman *et al.*, 2006). Mid-stream urine sample for suspected Urinary tract infections was collected in sterile container after proper instructions to patients. After incubation, Identification of bacteria from positive cultures was done with standard microbiological technique which included Gram staining and biochemical reactions (Koneman *et al.*, 2006; Forbes *et al.*, 1998). The antibiotic sensitivity test of all isolates was performed (according to CLSI guidelines) by modified Kirby Bauer's disc diffusion method on Mueller Hinton agar or Blood agar medium using antibiotic discs of Hi media Laboratories Pvt. Limited, India (Nitin Goel *et al.*, 2013).

#### RESULTS

Total 578 samples from clinical (Medicine, Pediatrics) and Surgical Departments (Surgery, Obstetrics and Gynecology,

\*Corresponding author: Shreeram A Deshpande,  
Karpagam Faculty of Medical Sciences and Research (TN Dr. M.G.R. Medical University) Coimbatore, Tamil Nadu, India -641032.

Ophthalmology, ENT) and I.C.U samples were included in this study. Out of 578 samples, 216 (37.3%) samples showed culture positivity and were analyzed bacteriologically using standard techniques, whereas 362 (62.7%) were sterile. Among 578 positive samples, 378 samples were from male patients and 200 samples were from female patients. Out of 378 samples from male patients, 130 (34.3%) were culture positive and among 200 samples from female patients, 86 (55%) were culture positive. Out of 181 samples from Medicine Department, 103 (57%) were culture positive. For surgery department, out of total 76 samples, 9 (12%) samples were culture positive. Obstetrics and Gynecology Department with 200 samples, 60(30%) samples showed culture positivity. The least number of culture positivity in this study was from Intensive Care Unit where out of total 33 samples only 2 (0.09%) showed culture positive, but isolates were ESBL Producers. Among Gram positive isolates, *Staphylococcus aureus*, *Coagulase negative staphylococci* were the most frequently isolated species and *E.coli* and *Klebsiella* were the most frequently Gram negative isolate.

Table 1. Sex wise Distribution

Sex	Total number of samples	Culture positive	Percentage
Male	378	130	34.3%
Female	200	86	55%

Table 2. Department wise Distributions of Cases

Department	Total samples	No. of culture positive cases	Percentage
Medicine	181	103	57%
Surgery	76	9	12%
Ob&Gy	200	60	30%
Pediatrics	40	12	30%
Ophthalmology	26	14	54%
ENT	22	16	73%
I.C.U.	33	02	0.09%

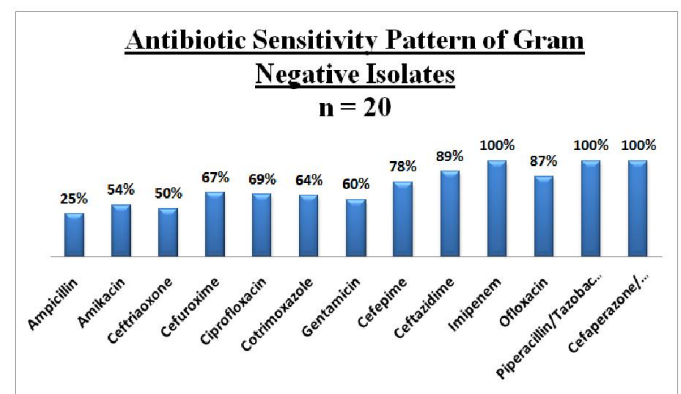
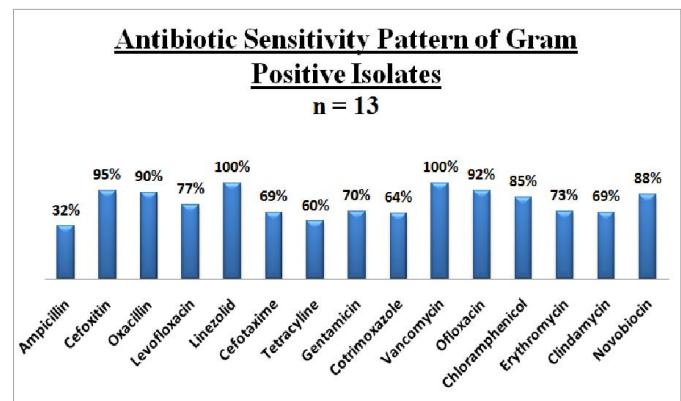
Table 3. Sample wise Distribution of Cases

TOTAL NO OF SAMPLES	CULTURE POSITIVE	PERCENTAGE
URINE (380)	140	36.8%
PUS(64)	45	70.3%
SPUTUM(57)	17	29.8%
BLOOD(30)	3	10%
EYESWAB(22)	5	22.7%
THROAT SWAB(10)	2	20%
EAR SWAB(8)	4	50%
ASCITIC FLUID(2)	0	0
PLEURAL FLUID(1)	0	0
CSF(3)	0	0
NASAL SWAB(1)	0	0
TOTAL(578)	TOTAL 216	37.3%

From the above table it is evident that the Percentage of culture positive was highest in Urine samples followed by Pus, Sputum, Ear swab and other samples. Among the three CSF samples none showed growth and it was clinically correlated.

Antibiotic sensitivity of Gram positive isolates showed 100% sensitivity to Vancomycin and Linezolid. 95% were sensitive to Cefoxitin and 2 Methicillin Resistant *Staphylococcus aureus* were isolated. Gram Positive isolates showed 64% and 73%

sensitivity to Cotrimoxazole and Erythromycin respectively. Maximum resistance in this study was seen with Ampicillin.



All the Gram negative isolates were 100% were sensitive to Imipenem and cefoperazone/ Sulbactam. 87% of the isolates were sensitive to Ofloxacin, 69% to Ciprofloxacin. Totally 6 isolates were confirmed ESBL Producers, among them 3 isolates were from urine samples from Medicine Department; 1 isolate was from Ob and Gy Dept and 2 isolates were from I.C.U. All of the ESBL producers were totally resistant to all antibiotics, except Imipenem to which they were 100% sensitive. In this study Maximum Resistance was seen to Ampicillin.

## DISCUSSION

In this study, total 578 samples from patients admitted in Medicine, Surgery, ICU were included. Many of the patients were from small villages in and around Othakkalmandapam, Coimbatore. The culture positivity from this sample volume was 37.3%. This rate was probably due to the low socioeconomic status of the patients, usually associated with malnourishment and anemia, which can lower the general resistance.

Out of total 578 samples, 378 (65.39%) were male patients and 200 (34.6%) were female patients. The incidence of infection was more common in males than in females. A study carried out in three hospitals (Federal Medical Centre, Owerri, Imo State University Teaching Hospital, Orlu and General Hospital, Okigwe) by Ohalet et al<sup>13</sup> also supported the result who reported that the males (59.3%) were more prone to wound infection than females (40.7%). The study showed that, there

was an increase in rate of infection with increasing age and maximum rate was observed in age group of 70-79 years. Subramaniam *et al* have reported higher rate of infections at extreme age (Subramaniam *et al.*, 1973) Coagulase positive *Staphylococci* (54.3%) were the predominant Gram positive bacteria isolated. High isolation rate of this bacterium with various infections was reported by the Public Health laboratory Service report and by Dineen *et al* and Thurn *et al*. Among Gram negative bacteria, *E.coli* (55%) was the predominant bacteria. Sengupta *et al* reported that *E.coli* is next to *Pseudomonas* as a causative organism in such infections A number of reports on wounds infection from different parts of the world indicated that both organisms were the most frequent isolates from different types of sepsis including wound (Mohammed *et al.*, 2011; Manjula *et al.*, 2007; Thanni *et al.*, 2003 and Glacometti *et al.*, 2000). In the determination of the susceptibility of these *Staphylococcus aureus* on sixteen selected antibiotics by agar diffusion technique showed that *Staphylococcus aureus* tend to be resistant to a wider spectrum of antibiotics. This finding is in agreement with the work of Adcock *et al.* (1998), Sani *et al.* (2013) and CDC (1999) who reported that clinical Staphylococci are resistant to multiple antibiotics. In this study, 75% of the *E.coli* isolates were resistant to ampicillin, cefaclor, doxycycline and amoxicillin, 88.5% to erythromycin, cefuroxime, cefotaxime and ceftazidime. Sensitivity pattern of *E.coli* in our study as compared to others were ciprofloxacin (94%), ceftazidime (92%) (Weber *et al.*, 2009), ceftazidime (91%) ofloxacin (97%) (Kaufman *et al.*, 1998). So, reduced antibiotic sensitivity pattern noted for *E. coli* suggests its importance for hospital acquired infection. In this study all isolates of *Pseudomonas aeruginosa* showed 100% Resistance to Ofloxacin and two isolates of *Acinetobacter baumannii* from I.C.U. samples showed total resistance to all Antibiotics except Imipenem.

## Conclusion

The most common isolate in this study was *Staphylococcus aureus* followed by, *E.coli*, *Pseudomonas species*, *Enterococcus species*, *Klebsiella species*, *Enterobacter species* and others. Ofloxacin and Linezolid were the most effective antibiotics for Gram positive bacteria and Imipenem followed by Piperacillin/Tazobactam and Gentamicin were the most effective antibiotics for Gram negative bacteria. Even Cotrimoxazole showed better sensitivity There is an alarming increase of infections caused by antibiotic-resistant bacteria. Lack of uniform antibiotic policy and indiscriminate use of antibiotics may have led to emergence of resistant bacterial strains. *Pseudomonas* resistance to third generation antibiotics and Flouroquinolones like Ciprofloxacin are real threat to control various infections. *Acinetobacter* species nowadays has become very notorious and found frequently in Intensive care units, especially with VAP (Ventilator associated Pneumonia) patients. In this study oral drugs Ofloxacin, Ciprofloxacin, Cotrimoxazole and injectable drugs Amikacin, Gentamicin shows good sensitivity against gram negative organisms. In addition, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. An effective national and state level antibiotic policy and draft guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management. In conclusion,

retrospective studies help in understanding the local Antibiotic pattern of particular area and it is easy to develop antibiograms and formulate effective Hospital Antibiotic Policies.

## Conflict of interest

There is no conflict of interest by the author.

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