

Study of Aerobic Bacterial Etiology and Their Antibiogram from Pus Samples in a Tertiary Care Hospital

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ABSTRACT

Introduction: The spread of multidrug resistant bacteria has added a new angel to the problem of wound infections which are a major cause of morbidity. To avoid difficulty in treatment of such infections it is mandatory for every pus sample to undergo Culture and sensitivity.

Aim: To isolate and study the antibiogram of the aerobic bacteria from pus samples.

Materials and Methods: A total of 426 pus samples received from various wards in the Microbiology department. Andhra Medical College, Visakhapatnam were processed as per standard guidelines in the laboratory. All the aerobic bacterial isolates obtained were kept for antibiogram by Kirby Bauer's disc diffusion method as per CLSI Guidelines.

Results: Out of 426 samples 394 (92.4%) were culture positive. Among culture positive samples 90.6% were pure cultures and 9.4% were mixed isolates. Gram negative bacilli were 72.8% of the total isolates and 27.2% were Gram positive cocci. Escherichia coli and Klebsiella pneumonia were the predominant isolates (30.3% and 28.9%) followed by Pseudomonas aeruginosa (24%), Proteus species (9.7%) and Acinetobacter species (6.9%). Among Gram positive cocci Staphylococcus aureus (62.6%), Enterococci (20.5%) and Coagulase Negative Staphylococcus (11.2%) and Streptococci (3.7%). GNB were more sensitive to Colistin (92%), Amikacin (86%), Imipenem and Meropenem (86% and 84.4%), Piperacillin Tazobactam (84%), Gentamicin (78%), Cefaperazone Sulbactam (76.2%) and Ciprofloxacin (56%). Gram positive cocci were

sensitive to Linezolid and Teicoplanin (98% each), Vancomycin (96.2%), Clindamycin (84%), Gentamicin (79%), Azithromycin (76.4%), Ciprofloxacin (66%) and Amoxiclav (54%) out of 62.6% Staphylococcus aureus isolates 31.4% were MRSA and out of 72.8% of Gram negative bacilli 38.2% were ESBLs. **Conclusion:** As multidrug resistant bacterial strains are emerging in various infectious and pyogenic wound infection is most important cause of morbidity, it is important for a clinician to send all pus samples for microbiological analysis and their antibiogram before putting cases on

Key words: Pus samples, Multidrug resistance, Gram negative bacilli, Gram positive cocci, Antimicrobial sensitivity.

INTRODUCTION

Antibiotic resistance among bacteria is becoming more and more serious problem throughout the world. It is said that evolution of bacteria towards resistant to antimicrobial drugs, including multidrug resistance, is unavoidable because it represents a particular aspect of the general evolution of bacteria that is un-stoppable¹.

Pyogenic wound infection is major cause of morbidity. The pathogens isolated from infections differ depending on the underlying problem, location and type of surgical procedure. Most common organisms encountered are staphylococcus aureus, Klebsiella species, Escherichia coli,

Pseudomonas species, *Proteus* species, *Enterococci* species², *Enterobacter*, *Candida* and *Acinetobacter* species³.

Wound infection can be caused by variety of organisms like Bacteria, Virus, Fungi and Protozoa and may co-exist as polymicrobial communities especially in wound margins and in chronic wounds⁴. In many cases there is a mixed infection with more than one bacterial species⁵.

Staphylococcus aureus is most important pathogens in skin as well as soft tissue infections. Methicillin Resistant *Staphylococcus aureus* (MRSA) is prevalent in majority of the countries whenever it is sought for. MRSA is one of the important pathogens in hospitals acquired infectious^{4,6}.

The spread of multidrug resistant bacterial pathogens has added a new angel to the problem of wound infections. This is particularly worse in resource poor countries where sale of antibiotics is under poor control⁷.

A number of studies have been carried out in the west to monitor antimicrobial resistance at national level. The Academic and educational value of these studies is particularly useful for Microbiologists and infectious disease clinicians. The data collected from these studies are useful in improving antimicrobial use in those communities⁸⁻¹¹.

The present study is an attempt to know the current status of antibiotic sensitivity pattern of aerobic bacterial isolates in a Tertiary Care hospital of Visakhapatnam, Andhra Pradesh.

MATERIALS AND METHODS

A total of 426 pus samples received in the department of Microbiology, Andhra Medical College, Visakhapatnam in 2019 were processed as per the standard guidelines in the laboratory. The samples were collected from various wards in King George Hospital, Visakhapatnam. Gram's staining was done for all the samples and inoculated on Sheep blood agar and Macconkeys agar and incubated at 37°C for 24 hours. Organisms were isolated and

identified by standard biochemical reactions and antibiotic sensitivity was done on Muller Hinton agar by Kirby Bauer's disc diffusion method as per CLSI Guidelines.

RESULTS

Out of 426 pus samples processed, 92.4% (394) were culture positive and 7.6% (32) samples were culture sterile for aerobic growth.

Among 394 culture positive samples majority were from the male patients 58.6% (231) and 41.4% (163) were from females. Maximum samples were positive for culture in the age group of 21 to 30 years 30.2% (119) followed by 51 to 60 years 21.8% (86).

Out of 394 cultures positive samples 90.6% were pure cultures and 9.4% were mixed isolates. Gram negative bacilli were 72.8% of the total isolates and 27.2% were Gram positive cocci. *Escherichia coli* and *Klebsiella Pneumoniae* were the predominant isolates (30.3% and 28.9%) followed by *Pseudomonas aeruginosa* (24%), *Proteus* species (9.7%) and *Acinetobacter* species (6.9%). Among Gram positive cocci *Staphylococcus aureus* (62.6%), *Enterococci* (20.5%) and Coagulase Negative *Staphylococcus* (11.2%) and *Streptococci* (3.7%). GNB were more sensitive to Colistin (92%), Amikacin (86%), Imipenem and Meropenem (86% and 84.4%), Piperacillin Tazobactam (84%), Gentamicin (78%), Cefaperazone Sulbactam (76.2%) and Ciprofloxacin (56%). Gram positive cocci were sensitive to Linezolid and Teicoplanin (98% each), Vancomycin (96.2%), Clindamycin (84%), Gentamicin (79%), Azithromycin (76.4%), Ciprofloxacin (66%) and Amoxiclav (54%) out of 62.6% *Staphylococcus aureus* isolates 31.4% were MRSA and out of 72.8% of Gram negative bacilli 38.2% were ESBLs.

DISCUSSION

The microbial pathogens, as well as their antibiotic sensitivity pathogens may change from time to time and place to place.

The discovery of antibiotics revolutionized the management of infectious diseases. However, the overuse and misuse of antibiotics is leading to the emergence of resistance to these lifesaving drugs. Hospitals Antibiograms are commonly used to help and guide empiric antimicrobial treatment and are an important component of detecting and monitoring trends in antimicrobial resistance¹².

The microbiology laboratory plays a central role in the decision to choose a particular antimicrobial agent over others. Once the microbial species causing the disease is identified, a rational choice of the class of antibiotics likely to work on the patient can be made¹³.

In the present study, culture positivity was observed in 92.4% of pus samples which correlates with Vijeta Sharma etal¹⁴ who reported 93% of culture positivity, Swati Duggal etal¹⁵ (93.27%), Nirmala Grace etal¹⁶ (90.8%), whereas Asmabegaum Birdar etal¹⁷ and Hanumanthappa etal¹⁸ reported lower incidence of 66% and 56% of culture positivity in their studies.

Among culture positive samples 90.6% were Pure Cultures and 94% were Mixed Cultures which correlate with Asmabegaum Birdar etal¹⁷ who reported 92.89% and 7.1%, Prajuli etal⁴ (92% and 8%), Nirmala etal¹⁶ (88.2% and 11.8%) and Mohanth etal¹⁹ who reported (85.8% and 14.2%).

In the present study Gram negative bacilli isolated were 72.8% out of 394 cultures positive samples and Grampositive cocci were 27.2% which correlates with Nirmala etal¹⁶ (73.7% and 26.3%), Asmabegaum Birdar etal¹⁷, Jain etal⁷, Ghosh etal²⁰ and Hanumanthappa etal¹⁸ where as Prajuli etal⁴ in their study isolated more of Gram positive bacteria compared to Gram negative bacilli.

Among Gram negative bacilli, Escherichia coli and Klebsiella Pneumoniae were the predominant isolates followed by Pseudomonas species which correlates with Iffat Javeed etal²¹, whereas Vijetha Sharma

etal¹⁴, Rajeshwar Rao etal²² who reported Klebsiella as predominant isolate and Farzana R etal²³, Ehmer Abraham etal²⁴ and Soumya Kaup etal²⁵ reported Pseudomonas as the predominant isolate in their studies.

Staphylococcus was the predominant isolate among Gram positive cocci in the present study which correlates with Asmabegaum Birdar etal¹⁷, Swathi Duggal etal¹⁵, Nirmala etal¹⁶, whereas Vijetha Sharma etal¹⁴ reported very lower incidence.

The antibiotic susceptibility pattern of Gram negative bacilli and Gram positive cocci in the present study correlates with Nirmala etal¹⁶, Vijetha Sharma etal¹⁴, Soumya Kaup etal²⁵, Rajeshwar etal²², Balan etal²⁶, Asmabegaum etal¹⁷ and Swathi Duggal etal¹⁵.

In the present study MRSA was isolated in 31.4% of Staphylococcus aureus which correlates with Nirmala etal¹⁶ who reported 27%, Swathi Duggal etal¹⁵ reported 35.9% and Asmabegaum Birdar etal¹⁷ (39.47%). Out of 72.8% of Gram negative bacilli 38.2% were ESBLs in the present study. Raghunath D etal²⁷ reported in 2008 that coliforms have changed their susceptibility patterns extensively. According to them, β Lactam resistance is widespread among coliform bacteria due to vertical as well as horizontally acquired resistance factors. Researchers from Lahore have reported that resistance to β Lactam drugs amongst Escherichia coli and Klebsiella is alarming with resistance ranging from 35.5% to 43.82%^{8,29}.

CONCLUSION

Knowledge of the most common causative agents of infection and their antimicrobial susceptibility pattern is very essential for the judicious administration of empirical therapy before the culture results are available. Antimicrobial susceptibility of microorganisms varies from time to time and from place to place. Pyogenic wound infection is most important cause of morbidity and as multidrug resistant bacterial strains are emerging most commonly, it is important for a clinician to

send all Pus samples for microbiological analysis and their antibiogram before putting cases on antibiotics.

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