

**BACTERIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN
IN CENTRAL VENOUS TIP CATHETER**Nitasha Faiz*¹, Uzma Jabeen² and Samina Sadiq³

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ABSTRACT

Objective: The purpose of this study is to find out the frequency of colonization of by different bacterial pathogens and their antibiotic sensitivity pattern in our setting. **Material & Methods:** conducted a cross-sectional study at the Multan Institute of Cardiology. The study was conducted over six months from April 2020 to September 2020. Forty-three patients were selected through simple consecutive sampling having indwelling central venous catheters (CVCs). The isolated organisms were identified by standard microbiological procedure and subjected to antimicrobial sensitivity. SPSS-16 was used for statistical analysis. **Results:** In this study, a total of forty-three Catheter tips were evaluated through microbiological examination. Out of 43 samples, sixteen were found positive, six from peripheral blood and seven from the Tip of the catheter. Three patients had positive cultures both from blood and from the Tip of the catheter showing the same bacteria in both cultures. Remaining samples either had no organism grown or had nominal growth. Out of 43 samples, 16 (37.2%) showed significant growth of an organism. The most common organisms found in the culture were Acinetobacter (SPP) baumannii 5 (31.2%), Staphylococcus aureus 4 (25%), Coagulase Negative Staphylococcus 2 (12.2%), Pseudomonas aeruginosa 3 (18.7%) followed by and Klebsiella pneumonia 1 (6.25%) All five gram positive bacteria were sensitive to Vancomycin (100%) while Imipenim 4 (57%) and Amikacin (8 (50%) were sensitive for gram-negative bacteria **Conclusion:** The incidence of Catheter-related infection in our hospital was 37.2%. Acinetobacter baumannii was the most common pathogen isolated from culture. Vancomycin and linezolid were sensitive for Gram-positive bacteria, while Imipenim and Amikacin were sensitive for gram-negative bacteria. Piperacillin-tazobactam proved to be a right broad-spectrum antibiotic. Empirical therapy for such infections in health care settings should be used to get a good outcome.

KEYWORDS: Antibiotic sensitivity, Central venous catheter, Culture, Intensive care unit.**INTRODUCTION**

A central venous catheter is a long, fine, adaptable tube. It is usually inserted in centrally located larger veins (subclavian, internal jugular, and femoral vein) until it reaches a large vein near the heart. CVCs are indispensable in medical care today. They are used to hemodynamic status through central venous pressure, blood sampling, hemodialysis, plasmapheresis, and for administering medications, fluids, blood products.^[1-2]

A Central venous catheter insertion is a commonly performed procedure in critically ill patients and can lead to mechanical and infectious complications.^[3-4] Mechanical complications include arterial puncture, pneumothorax, mediastinal hematoma, haemothorax, and injury to adjacent nerves. The rate of mechanical complications ranges from 0-12%, according to the experience of the operator and site of catheterization.^[5] Patients with CVCs are at risk of developing local and systemic infectious complications like local insertion-site

infection. Infectious complications, especially central line-associated bloodstream infection (CRBSI), are potentially associated with poor patient outcomes, high morbidity and mortality, increasing hospitalization, and hospital costs.^[6]

A definitive diagnosis of CRBSI requires that the same organism be isolated from at least one percutaneous blood culture and the catheter tip.^[7] Interpretation of catheter tip cultures in the absence of concomitant blood cultures is problematic as bacteremia occurs in only 10–15% of colonized catheters.^[8]

Approximately 78% of critically ill patients require some CVC, and 90% of catheter-related bloodstream infections are -CVC related.^[3] Two-thirds of these infections are caused by Gram-positive bacteria, predominantly Gram-positive cocci.^[4] CVCs are colonized by microorganisms, including Staphylococcus aureus, which is the most common cause of CVC infections.^[9]

In a USA study, the infection rate was 4%, while Bahrain, India, and Pakistan were 9.7%, 27.77%, and 20%, respectively.^[3-5] No such study was done in the Multan Institute of Cardiology before, so we have no idea about the CRI rate and bacteria involved and their sensitivity pattern in our hospital. This research study was carried out to fill this gap in patient management. This study aims to find the incidence of culture-positive CVC tip, the pattern of organisms isolated, and their antibiotic sensitivity pattern.

MATERIALS AND METHODS

We conducted a cross-sectional study at the Multan Institute of Cardiology. The study was conducted over six months from April 2020 to September 2020. The sample size in our study was relatively small, consisting of 43 catheter tips calculated by using the WHO sample size calculator, taking confidence level 95%. Both males and females older than 20 years of age admitted in the intensive care unit required a central venous catheter line.

Exclusion Criteria

Patients who have a central venous catheter already in place at the time of admission were excluded.

Patients were having signs of pre-existing infection.

Patients who had used CVC for hemodialysis were excluded.

Patients who did not provide consent were excluded.

All removed catheters were not submitted for Tip culture and sensitivity. The physician decided based on a person's clinical condition.

Data was collected through a structured questionnaire with four components: (1) Demographic details; (2) Date of insertion and removal of a catheter; (3) Result of Culture and sensitivity of tip of catheter; (4) Result of culture and sensitivity of peripheral blood.

Under aseptic conditions, we remove the catheter, cut about 4 cm segment from the catheter tip by a sterile scissor, and then place it in a sterile container to be transported to the lab for a catheter tip culture (CTC) as early as possible. The two samples were cultured by routine microbiological methods and blood culture and antibiotic sensitivity performed.

Institutional review boards approved the study protocol. Statistical analysis was performed using Microsoft Excel.

RESULTS

In this study, a total of forty-three Catheter tips were evaluated through microbiological examination. The mean duration of Central venous catheter in the body was five days ± 1.2 SD and range from 4-8 days. Out of 43 samples, sixteen were found positive, six from peripheral blood and seven from the Tip of the catheter. Three patients had positive cultures both from blood and from the Tip of the catheter showing the same bacteria in both cultures. Remaining samples either had no organism grown or had nominal growth.

Out of 43 samples, 16 (37.2%) showed significant growth of an organism. The most common organisms found in the culture were *Acinetobacter* (SPP) *baumannii* 5 (31.2%), *Staphylococcus aureus* 4 (25%), Coagulase Negative *Staphylococcus* 2 (12.2%), *Pseudomonas aeruginosa* 3 (18.7%) followed by and *Klebsiella pneumoniae* 1 (6.25%) as elaborated in Table I.

Among these 16 isolates were tested for antibiotic susceptibility pattern. The details of the antimicrobial susceptibility pattern of overall microorganisms are shown in table 2.

Table 1: Frequencies of isolated bacteria in culture (n 16).

Bacterium	Number	Percentage
<i>Acinetobacter</i> (Spp) <i>baumannii</i>	5	31.2%
<i>Pseudomonas aeruginosa</i>	3	18.7%
Coagulase Negative <i>Staphylococcus</i>	2	12.2%
<i>Staphylococcus aureus</i>	4	25%
<i>Klebsiella pneumoniae</i>	1	6.25%
<i>E. Coli</i>	1	6.25%

Table 2: Antibiotic Susceptibility pattern of bacteria.

Antimicrobials	Number of isolates tested	Number of sensitive isolates (%)	Number of resistant isolates (%)
Amikacin	16	8 (50%)	8 (50%)
Ampicillin	16	1 (6.25%)	15 (93.7%)
Cefixime	15	1 (6.6%)	15 (93.7%)
Ceftriaxone	16	5 (31.2%)	11 (68.7%)

Ciprofloxacin	12	2 (16.6%)	10 (83.5%)
Imipenem	7	4 (57%)	3 (50)
Linezolid	5	5 (100)	0
Piperacillin-tazobactam	6	5 (83.3%)	1 (16.7%)
Vancomycin	5	5 (100)	0

DISCUSSION

Central Venous catheters are the most often used indwelling catheter and have become essential tools for critically ill patients. However, this routine procedure is not immune to complications. They act as a portal of entry of bacteria that colonize the skin adjacent to the entry point or may serve as foreign bodies that harbor microcolonies, leading to catheter-related bloodstream infections (CRBSI).^[2] Thus, the definitive diagnosis of CRI can be made only by using a combination of clinical signs and symptoms and the culture of the Catheter and blood.^[10] A major problem in detecting infection of intravascular catheters is the difficulty in distinguishing infection from contamination. In our study, out of 43 patients, 16 (37.2%) patients were found positive, six from peripheral blood, and seven from the Tip of Catheter. Three patients had positive cultures both from blood and from the Catheter's tip showing the same bacteria in both cultures. Napalkov et al., in a study done in the USA, reported the CRI rate as 4%. While in Bosnia and Herzegovina, the infection rate was 6%.^[11-12] and that of Bahrain was 9.7%.^[13] In the above studies infection rate was very low as compared to our study. The study in India showed the CRI rate as 27.77%, while that done in Rawalpindi and Abbottabad, Pakistan showed the CRI rate as 20%.^[9]

This erraticism of incidences in different studies could be due to factors like techniques, site of catheterization, type of Catheter used, nursing care, and diagnostic criteria used for diagnosing CRI.

Acinetobacter baumannii was the most common organism isolated (29%), which contrasts with similar studies done in the past.^[14] A study carried out in China also found *Acinetobacter baumannii* (18.75%) was the most common pathogen on intravascular catheters in ICU patients with catheter-related infection and followed by *S. epidermidis*.^[15] This may be due to the emergence of *Acentiobacter* species as a common colonizer in hospitalized patients in recent years.^[16]

However, contrary to our results, Harsha et al., in his study, reported that Coagulase Negative *Staphylococcus* 65%, 15% *Staphylococcus aureus*, 10% *Klebsiella pneumoniae*, and 5% *E. coli*. In a study done in Bosnia and Herzegovina, the incidence of CRI was 6%. 67% CRI were due to gram-positive bacteria, and 61.37% were due to gram-negative bacteria, which is similar to our study.^[16]

In our study, we found very high antibiotic resistance overall. All gram-positive bacteria were sensitive to

Vancomycin, and linezolid and 90% gram-negative bacteria were sensitive to Amikacin, which is almost the same as other studies.^[6] However, routinely used antibiotics, like ciprofloxacin, cefixime, and Ceftriaxone, are mostly resistant.

In our study, the sample size is small, and the study is carried out in a single center. More studies should be done with a significant sample size and multiple centers to improve the results further.

CONCLUSION

The incidence of Catheter-related infection in our hospital was 37.2%. *Acinetobacter baumannii* was the most common pathogen isolated from culture, followed by *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*. Vancomycin and linezolid were sensitive for Gram-positive bacteria, while Imipenem and Amikacin were sensitive for gram-negative bacteria. Piperacillin-tazobactam proved to be a right broad-spectrum antibiotic. Empirical therapy for such infections in health care settings should be used to get a good outcome.

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