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Research Article

A Study of Bacterial & Fungal Infections in Patients Undergoing Hemodialysis & Their Antimicrobial Susceptibility Pattern in TertiaryCare Hospital

Shanthi V[1*], Gerard Rakesh J[1]

[1]Department of Microbiology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Puducherry, India

***Corresponding Author**: Shanthi V
*Email: drshanthiviswa@gmail.com

Abstract:
Catheter-related bloodstream infection (CRBSI) is the incidence of bacteremia originating from an intravenous catheter and is also the most common cause of nosocomial bacteremia. They are also the leading cause of Bacteremia and Septicemia in hospitalized patients. The majority of CRBSIs are associated with CVCs, and in prospective studies, the relative risk of CRBSI is up to 64 times higher with CVCs than with peripheral venous catheters. Globally, chronic kidney disease (CKD) has become a major public health problem. CKD is not only a public health problem, but also an important socioeconomic problem known to lead to cardiovascular complications and premature death, as well as renal failure. There are three modalities of renal replacement therapy for ESRD: hemodialysis (HD), peritoneal dialysis (PD), and renal transplantation (KT). Because critically ill patients depend on reliable and safe vascular access, intravascular devices that provide such stable access have revolutionised critical care. However, these devices also carry significant potential for the development of iatrogenic diseases leading to catheter-related bacteremia or candidemia.
Knowledge of the prevalence and profile of catheter-related infections would help improve infection control practices and management of Nosocomial Sepsis. The present study assessed the prevalence & risk factors associated with bloodstream infections from central venous catheters and colonization of CVCs over a 1-year period in the intensive care unit of a tertiary care medical college hospital and determined the microbiological profile and antibiotic susceptibility patterns of organisms causing bloodstream infections from CVCs.
Antimicrobial susceptibility testing was done using standard strains as referral strains *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922, and *Pseudomonas aeruginosa* ATCC 2785. Gram negative and Gram positive bacterial were tested against various antibiotics.
The current study conducted among dialysis patients, showed 55% Culture positivity for Aerobic bacteria and 4.2% fungal isolate in the Catheter tip sample, while, 22.8% Culture positivity for Aerobic bacteria and 1.7% fungal isolate in Peripheral Venous Blood sample. The proportion of Peripheral venous bacterial isolate and the fungal isolate was significantly higher when the frequency of catheterization was more than 10 times.

Keywords: Catheter-related bloodstream infection (CRBSI), bacteremia, septicemia, chronic kidney disease (CKD), hemodialysis (HD), peritoneal dialysis

***Author for correspondence: Email:** *drshanthiviswa@gmail.com*

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Introduction:

According to the World Health Organisation (WHO), a Nosocomial infection, also known as a hospital-acquired infection, is an infection that occurs in a patient during treatment in a hospital or other healthcare facility and was not present or spread at the time of admission (1). The leading cause of hospital-acquired infections, associated not only with the highest morbidity and mortality but also with high costs, is Central venous Catheter-related bloodstream infections (CRBSI), whose health outcomes depend on the associated organisms, underlying premorbid conditions, timeliness, and appropriateness of treatment/interventions.

According to a 2018 estimate, the number of patients in India requiring chronic dialysis are approximately 175,000, which translates to a prevalence of 129 per million population (2).

Catheter-related bloodstream infection (CRBSI) is the incidence of bacteremia originating from an intravenous catheter and is also the most common cause of nosocomial bacteremia. Intravascular catheters are an integral part of modern practice and are used in critically ill patients to administer fluids, blood products, medications, nutritional solutions, and hemodynamic monitoring. Central venous catheters (CVCs) pose a greater risk for device-related infections than any other type of medical device and are a major cause of morbidity and mortality. They are also the leading cause of Bacteremia and Septicemia in hospitalized patients. The majority of CRBSIs are associated with CVCs, and in prospective studies, the relative risk of CRBSI is up to 64 times higher with CVCs than with peripheral venous catheters. Globally, chronic kidney disease (CKD) has become a major public health problem. CKD is not only a public health problem, but also an important socioeconomic problem known to lead to cardiovascular complications and premature death, as well as renal failure (3). With the availability of renal replacement therapy, long-term treatment of patients with end-stage renal disease (ESRD) has become possible (4). There are three modalities of renal replacement therapy for ESRD: hemodialysis (HD), peritoneal dialysis (PD), and renal transplantation (KT). The choice of modality is influenced by several factors, including socioeconomic status, education level, public health policy, and patient wishes and disease severity.

Because critically ill patients depend on reliable and safe vascular access, intravascular devices that provide such stable access have revolutionised critical care. However, these devices also carry significant potential for the development of iatrogenic diseases leading to catheter-related bacteremia or candidemia (5).

The primary reason that catheter-related bloodstream infections (CRBSI) are asignificant clinical problem is the ongoing changes in the at-risk population, the changing spectrum of available pathogens, and the increased use of broad-spectrum antibiotics (6,7).

The Centres for Disease Control and Prevention (CDC) National Nosocomial Infections Surveillance (NNIS) system reports that the median rate of CRBSI in ICUs of all types ranges from 1.8 to 5.2 per 1000 catheter days, with a rate of approximately 25.6% (8). This highly variable rate is expected to be even higher in the developing countries of the world. Each new episode of CRBSI increases the risk of septicemia by 4-14% and the risk of death by 12-25%, in addition to prolonging hospital stay and increasing health care costs many times over (7-9).

The link between antimicrobial use and resistance is well documented in health care settings, communities, and countries (10,11). New mechanisms of antimicrobial resistance are emerging and spreading worldwide, threatening infectious disease treatment, leading to prolonged illness, disability, and death, and increasing health care costs (12).

High rates of resistance have been observed in antimicrobials commonly used to treat common bacterial infections. Resistance rates to ciprofloxacin, an antimicrobial drug commonly used to treat urinary tract infections, ranged from 8.4%to 92.9% for E. coli and from 4.1% to 79.4% for *K. pneumoniae* in 33 and 34 reporting countries, territories, and areas, respectively, after applying the GLASS cut-off values (13).

Knowledge of the prevalence and profile of catheter-related infections would help improve infection control practices and management of Nosocomial Sepsis. The present study aims to assess the prevalence & risk factors associated with bloodstream infections from central venous catheters and colonization of CVCs over a 1-year period in the intensive care unit of a tertiary care medical college hospitaland to determine the microbiological profile and antibiotic susceptibility patterns of organisms causing bloodstream infections from CVCs. Knowledge of the prevalence and profile of catheter-related infections would help improve infection control practices and management of Nosocomial Sepsis.

The present study aims to assess the prevalence & risk factors associated with bloodstream infections from central venous catheters and colonization of CVCs over 1-year period in the intensive care unit of a tertiary care medical college hospital to determine the microbiological profile and antibiotic susceptibility patterns of organisms causing bloodstream infections from CVCs.

OBJECTIVES:

To determine the proportion of culture positivity for bacterial and fungal isolates among the dialysis

patients in the catheter tip and peripheral venous blood sample

To determine the antimicrobial susceptibility pattern for the identified bacterial isolates in the catheter tip and peripheral venous blood sample.

Materials and Method:

The study was conducted as a Cross sectional study, patients from dialysis unit of a tertiary care hospital between Feb 2021 to Sep 2022. Convenient sampling technique was used. Patients fulfilling the inclusion criteria included for the study.

Inclusion criteria:

Patient above 18 years of age.

Patient with acute or chronic renal failure on hemodialysis with Central venous catheter.

Patient with or without signs & symptoms of septicaemia any time after 48 hrs of insertion of Central venous catheter during hospitalization.

Willing to participate in the study.

Exclusion Criteria**:**

Patient with blood culture positive before dialysis.

Patient who had taken antibiotics in the last 1 month.

Data Collection Method:

Using the content validated case proforma the data collection was done. The study parameters in the proforma included,

- Basic socio demographic variables
- Cause of Admission for Dialysis
- Details of duration and Frequency of Dialysis
- Details of Antibiotic usage during the dialysis

The patient's peripheral venous blood and Catheter tip sample was collected under aseptic condition for identification of Bacterial and Fungal isolates, and the antibiotic susceptibility for the same is done using the below mentioned procedure.

METHOD OF SAMPLE COLLECTION AND PROCESSING

Safety precautions:

The sample was collected under strict aseptic precautions and processed in Biosafety level 2 cabinet.

Biomedical Waste Management:

Bio medical waste generated during collection and processing of samples has been disposed properly as per biomedical waste management guidelines 2018.

Sample Collection Method:

The Peripheral Blood was collected by venepuncture technique (14). Catheter Removal Technique (15), Semi Quantitative Roll Plate Method (16), Segment washing (or) Endoluminal Flush Technique (17), Interpretation of Bacterial Culture (18), Catheter Colonization, Catheter Related Local Infection (19), and Catheter Related Blood Stream Infection.

The collected samples were identified by Gram stain technique, subjected to various biochemical reactions as follows, Hanging drop method, Catalase test, Oxidase test, Indole test, Methyl red and voges-Proskauer test, Citrate test, Urease test, Triple sugar iron test, Phenyl alanine deaminase test, Sugar fermentation tests, LAO decarboxylation test, Oxidative fermentation test, Mannitol motility medium, Catalase test/modified oxidase, Oxidative fermentation test, Coagulase test (slide/tube) and Sugar fermentation test.

Antimicrobial susceptibility testing was done (20). Following Standard strains were used as referral strains *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922, and *Pseudomonas aeruginosa* ATCC 27853.

Gram negative bacteria were tested for the following antibiotics:

Gentamicin, Tobramycin, Ciprofloxacin, Ceftriaxone, Cefotaxime, Ceftazidime, Cefpodoxime, Piperacillin, Tazobactam, Meropenem, Imipenem & Cefoperazone sulbactam.

Gram positive bacteria were tested for the following antibiotics:

Gentamicin, Amikacin, Ciprofloxacin, Erythomycin, Clindamycin, Amoxicillin, Co-trimoxazole, Cephelexin, Cefoxitin, Amoxycillin-clavulanicacid, Linezolid &Vancomycin.

Kirby bauer disc diffusion method (18), Detection of MRSA (21), Susceptibility test to detect MRSA (21), and cefoxitin disc diffusion test was done.

The MIC test was performed to determine the susceptibility of all *Staphylococcus* isolates to Vancomycin.

Interpretation of Fungal Culture (22) was done.

STATISTICAL METHODS:

The data was entered in MS Excel and analyzed using SPSS 21.

RESULTS:

Distribution of Participants based on Socio demographic parameters (n=118) were given in table (1). Most 61(52%) of the participants were aged between 21-30 years. Male participants were more in number 61(52%).

Among the 118 participants, it was noted that proportion of males (39.3%) were higher among 21-30 years and proportion of females (33.3%) were higher among 41-50 years based on age category and gender.

Out of 118 participants admitted for Dialysis majority of them 83 (70%) were

diagnosed to have Chronic Kidney Disease.

Medical Renal Disease (51.5%) followed by Acute Diarrhoeal Disease (14.4%) was the major two precipitating factors for Acute Kidney Injury patients getting admitted for dialysis.

Uncontrolled Diabetes mellitus (35%) followed by Hypertension (32.5%) was the major two precipitating factors for Chronic Kidney Disease patients getting admitted for dialysis.

Culture positive for Aerobic bacteria was seen in 55% of the Catheter tip sample and fungal isolate were present for 4.2% of the Catheter tip sample.

Culture positive for Aerobic bacteria was seen in 22.8% of the Peripheral Venous Blood sample and fungal isolate were present for 1.7% of the Peripheral Venous Blood sample.

Gram staining demonstrated Gram positive cocci in 20 (16.9 %) and Gram negative bacilli in 10 (8.5 %) of cases. Polymorphs were seen in 32 (27.1 %) catheter tip samples as details given in table (2).

The culture positivity was highest in Roll plate method (55%) followed by Vortex (45%) and Segment washing method (17.8%) respectively.

Categorization of catheter related infection among the 118 catheters processed 46 (38.9%) was catheter culture positive but blood culture negative, hence categorized as catheter related infection (CRI). But 19 cases (16.1%) was positive for both catheter and blood culture and showed similar growth in both, therefore categorized as Catheter related blood stream infection (CRBSI) shown in table (3).

Distribution of Aerobic Bacterial isolates from various samples is given in table (4). *Staphylococcus aureus* was the predominantly isolated Gram positive cocci (GPC) from peripheral venous blood. *Acinetobacter baumannii* was the commonest Gram negative bacilli isolated from catheter tip.

Methicillin resistance was noted among *Staphyloccus aureus* isolates in 27.5% and 29.6% catheter tip and peripheral venous blood isolates.

Among the 5 fungal isolates identified from Catheter tip, one each of *Candida albicans, Candida parapsilosis, Candida tropicalis, Aspergillus flavus, Aspergillus fumigatus* was found and among the 2 fungal isolates from Peripheral Venous Blood, one each of *Candida albicans, Candida parapsilosis* was found (Table 5).

Association between site of catheterization and culture positivity for aerobic bacteria in Catheter tip (n=118) (Table 6). The positive culture of aerobic bacteria in Catheter tip was higher than negative culture when femoral vein was chosen as site of catheterization compared to Subclavian vein and Internal Jugular Vein; however, this was found statistically insignificant with a p value of 0.126.

Association between duration of catheterization and Culture positivity for aerobic bacteria in Catheter tip is shown in Table 7. The proportion of positive culture of aerobic bacteria in Catheter tip was higher than negative culture when duration of catheterization was between 5-10days compared to <5 days and > 10 days, however this was found statistically insignificant with a p- value of 0.059 (>0.05).

Association between frequency of dialysis and Culture positivity for aerobic bacteria in Catheter tip (Table 8). The proportion of positive culture for aerobic bacteria in Catheter tip was higher than negative culture when frequency of dialysis was > 10 times compared to 5-10 times and 1-5 times. However, this was found statistically insignificant with a p value of 0.128.

Association between frequency of dialysis and Culture positivity for aerobic bacteria in peripheral venous blood is shown in Table (9).

The proportion of positive culture for aerobic bacteria in Peripheral Venous Blood was higher than negative culture when frequency of dialysis was > 10 times compared to 5-10 times and 1-5 times and this was found statistically significant with a p value of 0.01 (<0.05).

Association between site of catheterization and Culture positivity for Fungal Isolates in Catheter tip is shown in Table 10. The proportion of positive culture for Fungal Isolates in Catheter tip was higher than negative culture when Femoral vein was chosen as site of catheterization compared to Subclavian vein and Internal Jugular Vein and this was found statistically significant with a p value of 0.0001 (<0.05).

Association between duration of catheterization and Culture positivity for Fungal Isolates in Catheter is shown in Table 11. The proportion of positive culture for Fungal Isolates in Catheter tip was higher than negative culture when Duration of catheterization was between 5-10 days compared to <5 days and > 10 days, however this was found statistically insignificant with a p value of 0.516 (>0.05).

Association between frequency of dialysis and Culture positivity for Fungal Isolates in Catheter tip is shown in Table 12. The proportion of positive culture for Fungal Isolates in Catheter tip was higher than negative culture when frequency of dialysis was > 10 times compared to 5-10 times and 1-5 times and it was found statistically significant with a p value of 0.001(< 0.05).

Association between frequency of dialysis and Culture positivity for Fungal Isolates in Peripheral Venous Blood is shown in Table 13. The proportion of positive culture for Fungal Isolates in Peripheral Venous Blood was higher than negative culture when frequency of dialysis was > 10 times compared to 5-10 times and 1-5 times and this was found statistically significant with a p value of 0.006(<0.05).

Antimicrobial susceptibility patterns of Gram positive cocci (GPC) are shown in Table 14. *Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus sheiferi, Staphylococcus warneri* have showed 100% sensitivity to Amikacin.

Staphylococcus schleiferi, Staphylococcus warneri have showed 100% sensitivity to Ciprofloxacin, Co-trimoxazole, Amoxicillin Clauvulanate and Cefoxitin.

Antimicrobial Susceptibility Patterns of Gram Negative Bacilli (GNB) are shown in Table 15 and Table 16. Both *Pseudomonas aeruginosa, Acinetobacter baumanni* showed 100 % sensitivity to Ceftazidime, Ciprofloxacin, Imipenem, Cefoperazone and Tazobactum respectively. *Klebsiella pneumoniae, Klebsiella oxytoca, Proteus mirabilis, Escherichia coli, Proteus vulgaris* showed 100% sensitivity to Gentamicin.

MIC of Vancomycin for *Staphylococcus aureus* is shown in Table 17. Among the 33 isolates of MRSA all were sensitive to vancomycin with MIC of <2.

DISCUSSION

Among the 118 dialysis patients, the proportion of males was higher than that of females, which was consistent with the results of the study by Parameshwaran et al, (17) which also showed a predominance of the male sex.

In the current study, 55% of catheter tip samples were positive for bacterial isolates. With a total number of 1516 catheter days, the incidence rate of the current study is 42/1000 catheter days. This incidence is closer to the range of incidence expected in dialysis patients, as noted by Shefali et al (23) who spoke of a usual incidence between 15 and 40, whereas Richet et al (24) reported the incidence rate as 32 per 1000 catheter days.

The result of the current study with an incidence of 42 per 1000 days is very high compared with the results of the study by Sahli et al (25), which found an incidence rate of 14.6% and an incidence rate of 10.8 per 1000 catheter days. Other studies by Shefali et al (23) and Richet et al (24) also showed a lower incidence rate of 23.6% and 24% compared to our current study finding.

This increased incidence rate in the current study could be due to three possibilities: better laboratory diagnostic facilities and careful efforts in the preparation of culture plates; possibly poor hygiene practices during the catheterization procedure in the dialysis patients, although this possibility is very low because complete aseptic precautions were followed; different population groups withdifferent comorbidities and predisposing factors.

In the current study, the main organisms contributing to positive culture were *Staphylococcus aureus, Staphylococcus epidermidis, Acinetobacter baumannii,* and *Pseudomonas aureginosa.* Richet et al (24) also reported that *Staphylococcus epidermidis, Staphylococcus aureus*, and *Pseudomonas aureginosa* were the major organisms isolated. Sadoyama et al (26) also reported that *Staphylococcus aureus* as the most common microorganisms at the insertion site.

In the current study, there was an increase in culture positivity of the catheter samples when the duration is more than 5 days, the finding was supported by Richet et al (24), which suggested the replacement of central catheter every 5 days due to the increase in positive culture rate after the duration of 5 days.

Mermel et al (27) reported that, higher colonization rate among the dialysis patients were observed with Internal Jugular vein; his finding was supported by Internal jugular venous catheters accounted for 90% of infections followed by subclavian venous catheters (10%).

In the current study among the 118 patients, majority of them had Internal Jugular vein as their catheter insertion site, this was similar to the finding of Sadoyama et al (26) where among the 116 patients most (69%) had central venous catheters (CVC).

In the study conducted by Oberai L et al (28) it was noted that, as the duration of catheterization increases to more than 14 days, the culture positivity increased significantly.

Other study by Esmanhoto et al (29) showed significant culture positivity with duration of catheterization as 21days. The current study showed highest sensitivity for identifying correctly the culture positivity was for Roll plate method (100%) compared to Segment washing method and Vortex method, this was similar to the study finding of Emilio *et al*,(30) which showed highest (98%) accuracy by roll plate method to identify the catheter related infections.

Maki et al (31) also supported the current study findings. Kaur et al., (32) also reported higher occurrence of Gram positive organisms as predominant one. However, the findings of Mansur et al (33), from Bangladesh which showed *Pseudomonas aeruginosa* to be the predominant isolate (37.5%). This could be because of the higher prevalence of Catheter Related Blood Stream Infection (CRBSI) in their study around 42% which is often associated with culture positivity of Pseudomonas *aeruginosa*, the current study has only 16.1% of Catheter Related Blood Stream Infection (CRBSI).

Rex et al (34) reported that *Candida* species to be the most common isolates in fungemic patients, and *C. albicans* accounted for over half of the fungi cultured. This was similar to the current study finding, which showed *Candida albicans, Candida parapsilosis* to be the common fungal organisms among the culture positive for fungi and also nearly 60% (3 out of 5 positive fungal catheter tip sample) of the fungal isolates was *candida* species.

From the current study, it was noted that, all the Gram positive cocci were susceptible to Amikacin and Amoxicillin clavulanate, while all the Gram negative bacilli were susceptible to Ciprofloxacin, Ofloxacin, Imipenem,Cefoperazone/Sulbactam.

In the study conducted by Karthiga et al (35), it was noted that the Gram positive bacteria were found to be susceptible to Vancomycin, Linezolid, Doxycycline and Gentamicin. Gram negative isolates susceptible to Tigecycline, Imipenem and Tobramycin. *Escherichia coli* isolates displayed resistance to Ampicillin, Amikacin and were susceptible to Ceftazidime, Cefotaxime, Piperacillin and Tazobactam.

Though there was certain similarity in the susceptibility pattern, the difference could be due to high prevalence of Catheter Related Blood Stream Infections among chronic hemodialysis patients (40%).

The current study conducted among dialysis patients, showed 55% Culture positivity for Aerobic bacteria and 4.2% fungal isolate in the Catheter tip sample, while, 22.8% Culture positivity for Aerobic bacteria and 1.7% fungal isolate in Peripheral Venous Blood sample. Femoral venous catheterization had significantly higher proportion of fungal isolate in catheter tip compared to subclavian and Internal Jugular vein. Significantly higher proportion of Bacterial Culture positivity in Catheter tip was seen when the catheter was present more than 10 days duration compared to < 10 days. The proportion of Peripheral venous bacterial isolate and the fungal isolate was significantly higher when the frequency of

catheterization was more than 10 times.

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Table 1: Distribution of Participants based on Socio demographic parameters (n=118)

Parameter	**Frequency (%)**
Age	
>18 -20 years	6 (5%)
21-30 years	39(33%)
31-40 years	24(20%)
41-50 years	31(27%)
51-60 years	11(9%)
61-65 years	7(6%)
Gender	
Male Female	61(52%) 57(48%)
ReligionHindu Christian Muslim	 97(82%) 13(11%) 8(7%)

Table 2: Gram staining of Catheter tip (n=118)

Findings	**Number**	**Percentage**
Gram positive organism with pus cells	20	16.9 %
Gram negative organism with pus cells	10	8.5 %
Presence of Polymorphs	32	27.1 %
No specific findings	56	47.5 %

Table 3: Categorization of Catheter related Infection

Catheter relatedinfection	**Number**	**Percentage**
Catheter related infection without positive blood culture	46	38.9%
Catheter related infection with positive blood culture	19	16.1%
Negative culture for both catheter and peripheral venous blood	53	45%

Table 4: Distribution of Aerobic Bacterial isolates from various samples

ISOLATES	**Catheter tip(n=65)**	**Peripheral VenousBlood (n=27)**
***S.aureus* MRSA**	19 (27.5%)	8 (29.6%)
MSSA	4 (5.7%)	2(7.4%)
S.epidermidis	18(26.1%)	2(7.4%)
S.warneri	1(1.4%)	-
S.schleiferi	1(1.4%)	1(3.7%)
Micrococcus Spp	3(4.3%)	-
Pseudomonas aeruginosa	5 (7.2%)	3(11.1%)
Acinetobacter baumannii	6(8.6%)	4(14.8%)
E.coli	3 (4.3%)	3(11.1%)
K.oxytoca	2(3.4%)	2(7.4%)
K.pneumoniae	1(1.4%)	1(3.7%)
Proteus mirabilis	1(1.4%)	1 (3.7%)
Proteus vulgaris	1(1.4%)	-

Table 5: Type of Fungal Isolates from various samples

Fungi	**Catheter Tip(n=5)**	**Peripheral VenousBlood (n=2)**
C.albicans	1(20)	1(50)
C.parapsilosis	1(20)	1(50)
C.tropicalis	1(20)	-
Asp.flavus	1 (20)	-
Asp.fumigatus	1(20)	-

Table 6: Association between site of catheterization and culture positivity foraerobic bacteria in Catheter tip (n=118)

Site of catheterization	**Positive Culture**	**Negative Culture**	**Significance**
Internal Jugular Vein	58(52.7%)	52(47.3%)	0.126
Subclavian Vein	3(75%)	1(25%)	
Femoral Vein	4(100%)	0(0%)	

Table 7: Association between duration of catheterization and Culture positivityfor aerobic bacteria in Catheter tip (n=118)

Duration of catheterization	Positive Culture	Negative Culture	Significance
< 5 days	6(50%)	6(50%)	0.059
5-10 days	31(68.9%)	14(31.1%)	
>10 days	28(45.9%)	33(54.1%)	

Table 8: Association between frequency of dialysis and Culture positivity foraerobic bacteria in Catheter tip

Frequency of dialysis	**Positive Culture**	**Negative Culture**	**Significance**
< 5	35(47.9%)	38(52.1%)	0.128
5-10	16(64%)	9(36%)	
>10	14(70%)	6(30%)	

Table 9: Association between frequency of dialysis and Culture positivity for aerobic bacteria in Peripheral Venous Blood (n=118)

Frequency of dialysis	Positive Culture	Negative Culture	Significance
< 5	9(12.3%)	64(87.7%)	0.001
5-10	8(32%)	17(68%)	
>10	10(50%)	10(50%)	

Table 10: Association between site of catheterization and Culture positivity forFungal Isolates in Catheter tip (n=118)

Site of catheterization	Positive Culture	NegativeCulture	Significance
Internal Jugular Vein	2(1.8%)	108 (98.2%)	0.0001
Subclavian Vein	1(25%)	3(75%)	
Femoral Vein	2(50%)	2(50%)	

Table 11: Association between duration of catheterization and Culture positivityfor Fungal Isolates in Catheter tip (n=118)

Duration of catheterization	Positive Culture	Negative Culture	Significance
< 5 days	0	12(100%)	0.516
5-10 days	3(6.6%)	43(93.4%)	
>10 days	2(3.2%)	59(96.8%)	

Table 12: Association between frequency of dialysis and Culture positivity forFungal Isolates in Catheter tip (n=118)

Frequency of dialysis	Positive Culture	Negative Culture	Significance
< 5	1(1.4%)	72(98.6%)	0.001
5-10	0	25(100%)	
>10	4(20%)	16(80%)	

Table 13: Association between frequency of dialysis and Culture positivity forFungal Isolates in Peripheral Venous Blood (n=118)

Frequency of dialysis	Positive Culture	Negative Culture	Significance
< 5	0	73(100%)	0.006
5-10	0	25(100%)	
>10	2(10%)	18(90%)	

Table 14: Antimicrobial susceptibility patterns of Gram positive cocci (GPC)

ANTIBIOTIC	*S. aureus* (n=33)				*S. epidermidis* (n=20)				*S. schleiferi* (n=2)				*S.warneri* (n=1)	
	Catheter Tip (n=23)		Peripheral Blood (n=10)		Catheter Tip (n=18)		Peripheral Blood (n=2)		Catheter Tip (n=1)		Peripheral Blood (n=1)		Catheter Tip (n=1)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Amikacin	23	100	10	100	18	100	2	100	1	100	1	100	1	100
Ciprofloxacin	17	74	7	70	14	78	1	50	1	100	1	100	1	100
Cotrimoxazole	16	70	10	100	15	83	1	50	1	100	1	100	1	100
Cephalexin	18	78	6	60	15	83	1	50	-	-	-	-	1	100
Ofloxacin	18	78	6	60	15	83	1	50	-	-	-	-	1	100
Erythromycin	18	78	7	70	14	78	1	50	1	100	-	-	-	-
Penicillin		-	-	-	14	78	1	50	1	100	-	-	-	-
Amoxycillin clavulunate	23	100	10	100	18	100	2	100	1	100	1	100	1	100
Cefoxitin	4	17	2	20	18	100	2	100	1	100	1	100	1	100

Table 15: Antimicrobial Susceptibility Patterns of Gram NegativeBacilli (GNB)

ANTIBIOTIC	***pseudomonas aureginosa*** **(n=8)**				***Acinetobacter baumannii*** **(n=10)**			
	Catheter tip (n=5)		**Peripheral Blood (n=3)**		**Catheter tip (n=6)**		**Peripheral Blood (n=4)**	
	N	%	N	%	N	%	N	%
Gentamicin	4	80	2	66.7	4	66.7	4	100
Ceftazidime	5	100	3	100	6	100	4	100
Ciprofloxacin	4	80	2	66.7	5	83.3	4	100
Ofloxacin	5	100	3	100	6	100	4	100
Imipenem	5	100	3	100	6	100	4	100
Cefoperazone/ sulbactam	5	100	3	100	6	100	4	100
Pipracillin/ Tazobactum	5	100	3	100	6	100	4	100

Table 16: Antimicrobial Susceptibility Patterns of Gram Negative Bacilli (GNB)

ANTIBIOTIC	***K. pneumoniae(n=2)***				***K. oxytoca(n=4)***				***P. mirabilis(n=2)***				***E. coli*** **(n=6)**				***P.vulgaris*** **(n=1)**	
	Catheter Tip (n=1)		Peripheral Blood (n=1)		Catheter Tip (n=2)		Peripheral Blood (n=2)		Catheter Tip (n=1)		Peripheral Blood (n=1)		Catheter Tip (n=3)		Peripheral Blood (n=3)		Catheter Tip (n=1)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gentamicin	1	100	1	100	1	50	2	100	1	100	1	100	3	100	3	100	1	100
Cefotaxime	-	-	-	-	1	50	1	50	-	-	1	100	2	66.6	1	33.3	-	-
Ceftazidime	1	100	1	100	1	50	2	100	-	-	1	100	2	66.6	1	33.3	-	-
Ciprofloxacin	1	100	1	100	2	100	2	100	1	100	1	100	3	100	1	33.3	1	100
Ofloxacin	1	100	1	100	2	100	2	100	1	100	1	100	3	100	3	100	1	100
Imipenem	1	100	1	100	2	100	2	100	1	100	1	100	3	100	3	100	1	100
Cefoperazone /sulbactam	1	100	1	100	2	100	2	100	1	100	1	100	3	100	3	100	1	100
Nitrofurantoin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norfloxacin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 17: MIC OF VANCOMYCIN FOR *Staphylococcus aureus*

Organism	**Minimum inhibitory concentration Break Point**			
	0.25□g/ml	0.5□g/ml	1.00□g/ml	>2□g/ml
S.aureus n =33s	20	13	-	-