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ASSESS THE PREVALENCE OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI) AMONG PATIENTS ADMITTED IN SELECTED ICUS AT TERTIARY HOSPITAL WESTERN UP

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ABSTRACT

Introduction: Central Line Blood Stream Infection (CLABSI) that develops in patients with central venous catheters and is one of the most common healthcare-associated infections (HCAIs) in critical care settings (CDC, 2020). Healthcare-associated infections significantly affect the quality, safety, and reputation of hospitals, with CLABSI being one of the most important device-related infections. Despite being indispensable in intensive care, central lines pose a greater risk of infection compared to other medical devices. Patients presenting with an abrupt onset of signs and symptoms of sepsis without an identifiable source should raise suspicion of intravascular device-related infection. While bloodstream infections associated with peripheral venous catheters are relatively low, the majority of serious catheter-related infections are linked to central venous catheters, especially in ICU patients. Globally Large multi-country surveillance programs like INICC report pooled rates of about 4.8–5.3 per 1,000 line-days. In India Older multicenter INICC showed ~7.9 per 1,000 line-days, while more recent studies report between 4 and 9 per 1,000 line-days.

Objective: The Asses the Prevalence of Central Line Associated Blood Stream Infection (CLABSI) Among Patients Admitted in Selected ICUs At Tertiary Hospital Western UP.

Methods: The study was conducted in Intensive care units SVBP Hospital, Meerut, Uttar Pradesh, India. Among 60 patients by using non- probability purposive sampling technique who met the eligibility criteria and written consent was taken from sample. A quantitative observational research approach design was adopted. The data was collected with structured demographic proforma, clinical assessment checklist, laboratory investigation reports, microbiological culture reports, and patient outcome records. After taking this data Descriptive and Inferential statistics used for data analysis.

Results: The study reveals that the prevalence of Central Line Associated Blood Stream Infection (CLABSI) among ICU patients was 30% (18/60) that there were not statistically significant associations between CLABSI occurrence and selected Clinical characteristics ($p<0.05$), while demographic variables did not show statistically significant associations ($p>0.05$). Pearson correlation "r" was computed to find the correlation. There was significant correlation found between complication of ICU stay with CLABSI ($r =0.771$, $p=0.001$). There was not significant correlation found between patient outcome at 14 days with CLABSI, ($r = 0.07$, $p=>0.05$) and clinical characteristics with CLABSI, ($r = 0.07$, $p=>0.05$).

Conclusion: There was a statistically significant positive correlation noted between complications during ICU stay and CLABSI status among ICU patients ($r=0.771$, $p=0.001$). However, no statistically significant correlation was noted between patient outcome at the end of 14 days and CLABSI status ($r=0.191$, $p=0.141$), and between signs and symptoms and CLABSI occurrence ($r=0.064$, $p=0.623$).

KEYWORDS: Central Line Blood Stream Infection, Center of Disease Control and Prevention….

INTRODUCTION

Central line-associated bloodstream infection (CLABSI) is a laboratory confirmed bloodstream infection occurring in a patient with a CVC in place for >48 hours that is not related to an infection at any other site. Preventing nosocomial infections pose a great challenge in ICU, because of the multi-drug resistant organisms treated with broad-spectrum antibiotics. Clinical practice guidelines from various organizations are available for prevention of vascular catheter related infections. Patients presenting with an abrupt onset of signs and symptoms of sepsis without an identifiable source should raise suspicion of intravascular device-related infection. While bloodstream infections associated with peripheral venous catheters are relatively low, the majority of serious catheter-related infections are linked to central venous catheters. The systemic inflammatory response syndrome (SIRS) plays a major role in the progression of CLABSI. Once pathogens invade the bloodstream, excessive cytokine release causes widespread endothelial injury and immune dysregulation. This results in Vasodilation, Capillary leakage, Coagulationabnormalities Microvascular thrombosis and Impaired oxygen

delivery. Ultimately, severe untreated CLABSI may progress to Sepsis, Septic shock and Multi-organ dysfunction syndrome (MODS) .

OBJECTIVES WERE:

1. To assess the prevalence of Central Line-Associated Bloodstream Infections (CLABSI) among patients admitted in selected ICU settings.
2. To analyze outcomes of patients with CLABSI
3. To find out the relationship between occurrence of CLABSI among patients with central line and their clinical characteristics.
4. To find out the association between the occurrence of CLABSI among patient admitted in ICUs with their demographic variable

METHODOLOGY

The researcher selected 60 ICU patients by using non-probability purposive sampling technique who met the eligibility criteria who have identifying the prevalence of CLABSI with the help Written consent was taken from sample by describing the purpose of the study and convinced them for the confidentiality of the information provided. A quantitative observational research approach design was adopted. Study was conducted 1-0102026 to 31-03-2026 at Sardar Vallabh Bhai Patel Hospital, Meerut, after the written permission was taken from the Dean/Principal of LLRM Medical college. The data was collected with structured demographic proforma, clinical assessment checklist, laboratory investigation reports, microbiological culture reports, and patient outcome records. After the three month the prevalence rate should check by using descriptive and inferential statistics.

RESULTS

The findings of study are presented according of the study. The data is prepared under the subsequent sections: -

Table 1 Frequency and percentage Description of demographic variable of the participants (N=60)

Demographic variables	Frequency (n)	Percentage (%)
Age in year		
18-37	23	38
38-57	22	37
58-68	12	20
More than 68	3	5
Gender		
Male	36	60
female	24	40
other	0	0
Comorbidities Present		
Present	19	32
Absent	41	68
Location prior to hospital admission.		
PHC, CHC	5	8
Other hospital	15	25
Another dept. Of same hosp.	40	67
Direct admission. to ICU	0	0
Hours of catheter insertion		
48-72	0	0
73-96	19	32
More Than 96	41	68
Indication of central line catheter	f	%
Specialized medication delivery	19	31.6
Difficult vascular access	14	23.3
Hemodynamic monitoring	10	16.7
Multiple infusion	7	11.7
Emergency access	7	11.7
Other rapid fluid	3	5
Duration of admission in ICU		
<3 days	18	30
4-7 days	28	46
8-14 days	7	12
>14 days	7	12
Central line catheter re-insertion		

Re-inserted	0	0
Not Re-inserted	60	100
Sites of catheter insertion		
Sub clavian	25	42
Internal jugular	28	46
Femoral	6	10
PICC	1	2
Lumen catheters are inserted		
Single lumen	7	12
Double lumen	41	68
Triple lumen	12	20
TPN administration through central line		
Administered	3	5
Not administered	57	95
Patient with Tracheostomy		
Present	23	38
Absent	37	62

Table 2 Frequency and percentage Data on prevalence of CLABSI among patients admitted in ICUs. (N=60)

CLABSI Status	frequency (f)	Percentage (%)
Positive	18	30
Negative	42	70

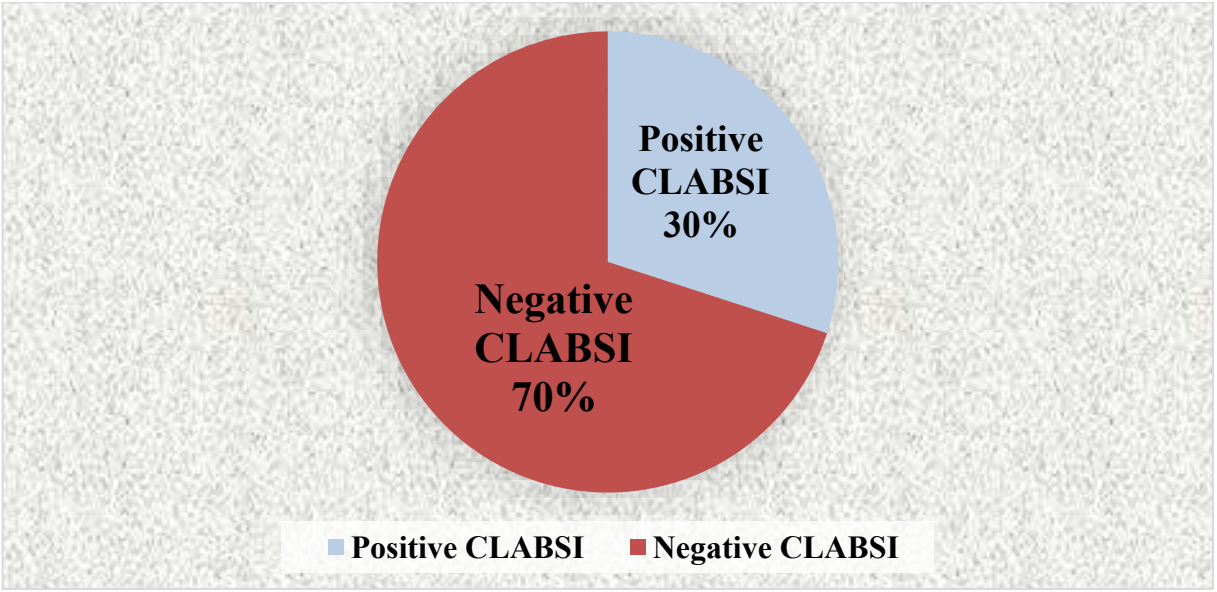

Table 3: Frequency and percentage Data on common microorganism causing CLABSI among patients admitted in ICUS (N=18)

Causative microorganism identified in Central Line Bloodstream	frequency (f)	Percentage (%)
Enterococcus Species	2	11.1
Staphylococcus another coagulase	5	27.8
Escherichia coli	3	16.7
Klebsiella spp.	5	27.8
Staphylococcus Aureus	3	16.7

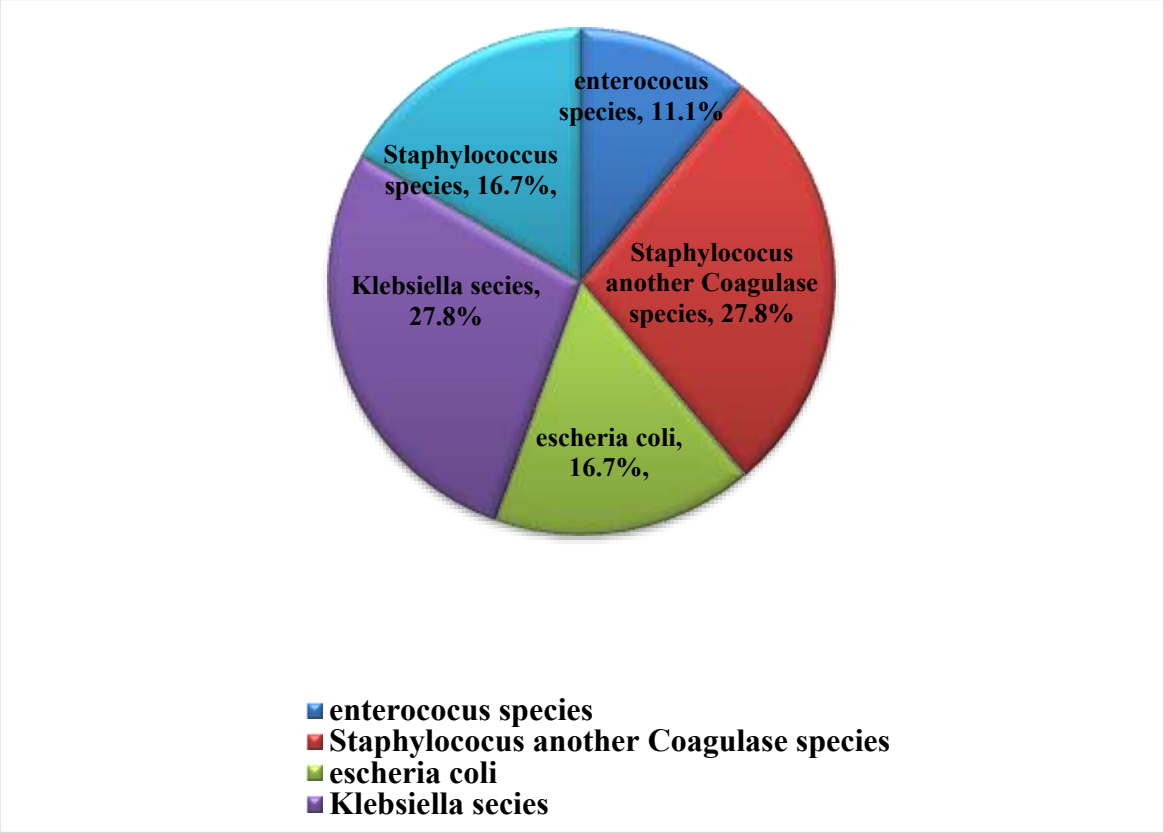

Table 4: Frequency and percentage Data on correlation between the clinical parameters and occurrence of CLABSI among patients admitted in ICUs (N=60)

Variables	Mean	Standard deviation	Mean difference	Pearson Correlation(r)	p-value
Complication during ICU stay	0.333	0.475	0.033	0.771	0.001(S)
CLABSI status	0.300	0.462			
Patient outcome end of 14 days	2.283	1.165	0.198	0.191	0.141(NS)
CLABSI status	0.300	0.462			

Significant at $p<0.05$ level of significance

Table 5: Frequency and percentage Data on association between the occurrence of CLABSI among patients admitted in ICUs and their selected demographic variables. (N=60)

Variable	CLABSI status		$\chi 2$	df	p-value	Remark
	CLABSI (Positive)	CLABSI (Negative)				
Age						
18-37 year	5	18	1.251	3	0.740	NS
38-57 year	8	14				
58-68 year	4	8				
More than 68 year	1	2				
Gender						
Male	9	27	1.071	1	0.300	NS
female	9	15				

other	0	0					
Comorbidities Present							
Present	9	10	3.994		1	0.045	S
Absent	9	32					
Location prior to hospital admission							
PHC, CHC	0	5	3.643		2	0.161	NS
Other hospital	7	9					
Another dept. Of same hosp.	11	28					
direct adm. to ICU	0	0					
Total length to stay in ICU							
48-72 hrs.	0	0	0.179		1	0.671	NS
73-96 hrs.	5	14					
More Than 96 hrs.	13	28					
Indication of central line catheter							
Specialized Medication delivery	3	4	1.536		5	0.089	NS
Difficult vascular access	2	12					
Hemodynamic monitoring	5	2					
Multiple infusion	2	17					
Emergency access	6	5					
Other rapid fluid	0	2					
Duration of admission in ICU							
<3 days	6	12	5.068		3	0.167	NS
4-7 days	11	17					
8-14 days	0	7					
>14 days	1	6					
Central line catheter re-insertion							
Present	0		0	9.6	1	0.001	S
Absent	18		42				
Sites of catheter insertion							
Sub clavian	4		21	5.848	3	0.119	NS
Internal jugular	11		17				
Femoral	2		4				
PICC	1		0				
lumen catheters are inserted							NS
Single lumen	2		5	0.080	2	0.960	
Double lumen	12		29				
Triple lumen	4		8				
Multi lumen	0		0				
TPN administration through central line							NS
Administered	1		2	0.016	1	0.897	
Not administered	17		40				
Total	18		42				
Patient with Tracheostomy							S

Yes	12	11	8.732	1	0.003	
No	6	31				

(p<0.05 level of significance) S: Significant, NS: Non -Significant

In prevalence data of CLABSI among ICUs patients table 2 show was 30% (18/60), whereas 70% (42/60) of the patients were CLABSI negative. The findings indicate that nearly one-third of the study participants developed CLABSI during their ICU stay, demonstrating a considerable burden of healthcare-associated bloodstream infections among critically ill patients.

The data presented in table 3 show Microbiological analysis revealed that Klebsiella spp. (27.8%) and coagulase-negative Staphylococcus species (27.8%) were the most common causative microorganisms isolated from CLABSI patients, followed by Escherichia coli (16.7%), Staphylococcus aureus (16.7%), and Enterococcus species (11.1%).

The data presented in table 4 show Karl Pearson correlation analysis demonstrated a statistically significant positive correlation between complications during ICU stay and CLABSI status ($r = 0.771$, $p = 0.001$). However, no statistically significant correlation was observed between patient outcome at the end of 14 days and CLABSI status ($r = 0.191$, $p = 0.141$).

The data presented in table 5 shows the Association analysis revealed that the occurrence of CLABSI was significantly associated with the presence of comorbidities ($\chi^2=3.994$, $p=0.045$), central line catheter re-insertion ($\chi^2=9.600$, $p=0.001$), and tracheostomy status ($\chi^2=8.732$, $p=0.003$). Patients with underlying comorbid conditions, those requiring catheter re-insertion, and those with tracheostomy were more likely to develop CLABSI. No statistically significant association was observed between CLABSI occurrence and age ($p=0.740$), gender ($p=0.300$), location prior to hospital admission ($p=0.161$), total length of ICU stay ($p=0.671$), indication for central line catheter insertion ($p=0.089$), duration of ICU admission ($p=0.167$), catheter insertion site ($p=0.119$), type of lumen catheter used ($p=0.960$), and total parenteral nutrition administration through the central line ($p=0.897$). These findings suggest that the occurrence of CLABSI was primarily influenced by specific clinical factors rather than demographic characteristics among ICU patients.

DISCUSSION

Discussion related to first objective was to assess the prevalence of Central Line–Associated Bloodstream Infections (CLABSI) among patients admitted in selected ICU settings

The present study assessed the prevalence of Central Line-Associated Bloodstream Infections (CLABSI) among ICU patients and found an overall prevalence of 30%, with 18 out of 60 patients meeting CDC/NHSN criteria for laboratory-confirmed bloodstream infection. This indicates a substantial burden of healthcare-associated infections in the ICU setting. The predominant isolates included Coagulase-negative Staphylococcus and Klebsiella spp., each accounting for 8.3% of cases.

These findings are comparable to a study by Safia Maqbool and Rajni Sharma (2023), which reported a CLABSI prevalence of 28% among ICU patients. Their study also identified a predominance of Gram-negative organisms, with Klebsiella spp. (10%), Acinetobacter spp. (8%), and Coagulase-negative Staphylococcus (7%) as common pathogens. Both studies highlight that prolonged catheterization increases infection risk and emphasize the importance of strict adherence to infection control practices, including central line care bundles and hand hygiene, to reduce CLABSI rates.

Second objective to analyze outcomes of patients with CLABSI

The present study examined outcomes among ICU patients and found that all CLABSI-positive patients developed severe complications, including sepsis and multi-organ dysfunction syndrome (MODS). A strong and statistically significant positive correlation was observed between complications during ICU stay and CLABSI status ($r = 0.771$, $p = 0.001$), indicating that patients who experienced complications were more likely to develop CLABSI.

In contrast, the relationship between patient outcomes at 14 days and CLABSI status was weak and not statistically significant ($r = 0.191$, $p = 0.141$), suggesting that short-term outcomes were not directly influenced by the presence of CLABSI in this cohort.

These findings are consistent with those reported by Aynur et al. (2017), who highlighted the substantial morbidity and mortality associated with CLABSI in ICU settings. Their study showed considerable variation in infection rates in developing countries and reported a mortality rate of 45.6% among affected patients. Importantly, higher severity scores (APACHE II) and infections caused by *Candida* species were identified as key predictors of mortality. The authors emphasized the need for clinicians to remain vigilant about the increasing role of fungal infections, particularly *Candida*, in worsening patient outcomes.

Third objective to find out the relationship between occurrence of CLABSI among patients with central line and their signs and symptoms.

The present study explored the relationship between the occurrence of central line-associated bloodstream infections (CLABSI) and the clinical presentation of patients with central lines. Fever emerged as the most frequently observed symptom, affecting 83% of patients, and thus appears to be a prominent early indicator of infection. Other commonly noted features included hypotension (67%) and tachypnea (32%), both of which reflect systemic inflammatory responses and may signal progression toward sepsis.

Despite the high prevalence of these clinical manifestations, statistical analysis did not demonstrate a significant association between the presence of signs and symptoms and the confirmed occurrence of CLABSI. This finding suggests that while such symptoms are valuable for raising clinical suspicion, they lack sufficient specificity to independently

predict infection. Therefore, definitive diagnosis should rely on microbiological confirmation, particularly blood culture analysis.

In alignment with these findings, Wang et al. (2026) further emphasized the complex relationship between CLABSI occurrence and the patient's clinical and biological status. Their study highlighted that infection is not solely a laboratory diagnosis but is often accompanied by observable physical changes and systemic instability. Notably, local signs at the catheter insertion site—such as erythema, edema, and purulent discharge—were strongly associated with positive blood culture results. These localized manifestations serve as important clinical cues, offering immediate bedside evidence of potential infection and supporting the role of clinical assessment as an essential component in the early identification of CLABSI.

Fourth objective is to find out the association between the prevalence of CLABSI among patient admitted in ICUs with their demographic variables.

The study examined the association between CLABSI and selected variables, revealing that comorbidities ($p = 0.045$), central line insertion practices ($p = 0.001$), and the presence of tracheostomy ($p = 0.003$) were significantly associated with infection. These findings indicate that patients with underlying illnesses, poor aseptic practices, and invasive procedures are at higher risk of developing CLABSI.

In contrast, no significant association was found with age, gender, duration of ICU stays, catheter insertion site, total parenteral nutrition, or catheter lumen type, suggesting that demographic factors have a lesser impact compared to clinical and procedural variables.

Supporting these findings, a study by R. K. Gupta (2018) in a tertiary care hospital similarly identified comorbidities, improper catheter practices, and invasive procedures as significant risk factors, while demographic variables showed no association. Overall, both studies highlight the critical importance of strict aseptic techniques and infection control practices in preventing CLABSI in ICU settings.

NURSING IMPLICATIONS

The study highlights the need for continuous nursing education and training programs to enhance nurses' knowledge and skills regarding CLABSI prevention and management. Nursing administrators should ensure adequate staffing, availability of infection prevention resources, and regular monitoring of adherence to central line care bundles. Furthermore, the findings provide a basis for future nursing research to evaluate the effectiveness of various preventive interventions and infection control strategies in reducing CLABSI rates and improving patient outcomes in intensive care settings.

Nursing Education

Based on the study's findings, nurses can implement the following strategies in their practice:

- Curriculum strengthening UG and PG nursing curricula should integrate updated CDC/NHSN CLABSI guidelines, insertion/maintenance bundles, and simulation-based training on central line care.
- In-service education regular workshops for ICU nurses on "zero CLABSI" initiatives, hand hygiene audits, and aseptic non-touch technique (ANTT) are essential.

Nursing Practice

- Regular assessment of catheter insertion sites for redness, edema, tenderness, and purulent discharge should be performed.
- Strict hand hygiene and aseptic techniques should be followed during catheter handling and dressing changes.
- Daily evaluation of the necessity of central venous catheters should be encouraged to reduce catheter duration and infection risk.

Nursing Administration

- Ensure adequate nurse-patient ratio in ICUs, as workload compromises aseptic technique. Provide continuous supply of sterile kits, chlorhexidine, and transparent dressings.
- Establish CLABSI rate as a nursing-sensitive quality indicator. Monthly audits and feedback, as seen in your study setting, can reduce rates.

Nursing Research

Future research should employ longitudinal, correlational, quasi-experimental, and mixed-methods designs to further investigate the relationships among healthcare structure, nursing care processes, and patient outcomes. Additionally, theory-based intervention studies are recommended to evaluate the effectiveness of nursing models in improving patient care quality and nursing practice.

RECOMMENDATIONS

- A comparative study may be conducted to assess outcomes among CLABSI-positive and CLABSI-negative patients over a longer follow-up period.
- Regular implementation of CDC/NHSN guidelines for central line care should be ensured.

LIMITATIONS

- The study was conducted limited sample size affectively generalizability.
- The duration of this study was short, restricted observations for long term outcomes.
- The study relied on hospital records, clinical observations, and laboratory reports, which may have been subject to documentation limitations

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