

Secondary Blood Stream Infection in SARSCOVID19 Pandemic

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Abstract:

Background:In Coronavirus disease (COVID-19) pandemic, bacterial co pathogen are found. Hospital acquired infections occurs as the patients has to stays in hospital for longer duration. Blood stream infection among the Hospital acquired infection are found to be increased.

Material And Methods: Out of 975 admitted patients 22% developed secondary bacterial infection in COVID positive and clinically suspected COVID patients. Isolation of gram positive cocci was more than gram negative bacilli. Majority were *Staphylococcus aureus* (34.5%) followed by *Enterococcus* species (28.3%). Among the gram negative bacilli *Acinetobacter baumannii* (14.8%) followed by *Klebsiella pneumoniae* (11%), *Pseudomonas aeruginosa* (6%) and *Escherichia. coli* (4%).

RESULT:Overall prevalence of secondary blood stream infection in SARS COVID-19 in our study is 22.7% and in COVID ICU is 21%.Out of 221 81 (36.6%) were hospital acquired infections and 128 were the blood stream infections present at the time of admission in hospital. Out of 221 culture positive samples 81 blood stream infections commonest pathogen isolated was gram positive cocci. Among the gram positive cocci *Staphylococcus aureus* 28(34.5%) was most common followed by *Enterococcus* species 23(28.3%).Gram negative bacteria were, *Acinetobacterbaumani*12(14.8%),*Klebsiella pneumoniae* 9(11.1%)*Pseudomonas aeruginosa* 5(6.1%) and *E.coli* 4(4.9%)

CONCLUSION:Predominance of gram-positivecocci in COVID -19 patients with high rate of methicilin resistant *staphylococcus aureus* (MRSA) was noted. The most gram negative bacilli isolated were multi drug resistant .This gives the indication of improving infection control practices and usage of proper antibiotics for patient's benefits.

Keywords:COVID-19, Secondary infections, Hospital acquired infections and Antibiotic sensitivity testing.

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I. Introduction

Viral infections are often associated with secondary infections of bacteria and fungi. In coronavirus disease (COVID-19) pandemic, hospital acquired infections in hospitals occur as the patients has to stays in hospital for longer duration. Just like other viral pneumonias, bacterial infections are common complications seen in hospitalized COVID-19 cases. Blood stream infection (BSI) accounts for 14% among the hospital acquired infection.

Bacterial infection is defined as an acute infection either coinfection on presentation or secondary infection emerging during course of illness. Bacterial coinfection upon admission has been reported in 3.1- 3.5%of COVID-19 patients, while secondary bacterial infections, following hospitalization in 15% of patients.

Blood stream infections are central line associated blood stream infections (CLABSI) and NONCLABSI. Among the blood stream infection Central Venous Catheter is increasingly used to manage critically ill patients. Catheter related blood stream infections independently increase hospital cost and hospital stay. Central venous catheter has a higher infection risk than other indwelling vascular access lines. This causes significant morbidity and mortality to the critically ill patients. Central venous catheter is indicated for the administration of intravenous fluids, infusions of medications, and parenteral nutrition, as well as for hemodialysis access and hemodynamic monitoring.

Patients hospitalized for suspected or confirmed COVID 19 often require high levels of support, including supplemental of oxygen or ventilation and strict input/output monitoring. Increased utilization of invasive devices such as indwelling urinary catheters and central venous catheters are also needed in these cases.

Treating Covid -19 patients requires more complex processes from diagnostic approaches to safety measures. Early diagnosis of Blood stream infections plays important role and is necessary for starting antibacterial therapy. The study was planned to identify the bacteria and their antibiotic sensitivity pattern causing Blood stream infections in COVID 19 patients. The study includes the patients admitted for more than 48 hrs in hospital and central venous catheter is in patient more than 2 days.

II. Material And Methods

The study was conducted from August 2020 to August 2021 in department of Microbiology Govt medical college Aurangabad. Inclusion criteria of this study were patients Clinically suspected or confirmed COVID 19 admitted in ICU having sign and symptoms of Septicemia after 48 hours of admission in hospital ICU. These patients had central venous catheter (CVC) insertion for more than 2 days in hospital. Such patients having Central venous catheter (CVC) insertion along with blood stream infection were categorized as CLABSI and those with no CVC as NONCLABSI.

III. Result

Total numbers of 975 blood culture samples were received in department of microbiology laboratory. Out of which 671 were from COVID ICU and 304 from NONCOVID ICU as shown in **table no.1**.

Isolation of organisms was done using Conventional and automated procedure using BACT/Alert Automated machine. Blood from patients were collected from Central line and peripheral line using aseptic precaution in BHI (Brain heart broth) and Bact/Alertbar coded bottles purchased from manufacturer (REF). Blood in BHI broth is incubated in incubator for 72 hour and subcultured on MacConkey and blood agar. This inoculated media is incubated overnight at 37°C. Smears are prepared from colonies; Organism are identified using biochemical test and Antibiotic sensitivity testing is done as per CLSI 2020 (7). Negative report of blood culture was dispatched after 7 days incubation.

Table no. 1

Sr. No	Wards	Total no. of samples	Organisms isolated	No organism (sterile)	Culture positive Organism
1	ICU(COVID)	671	142	529	21%
2	ICU(non COVID)	304	79	225	26%
	Total	975	221	754	22.7%

As shown in table no.1 out of 975 samples 221(22.7%) were culture positive while 6 71 were confirmed COVID cases by RT PCR out of which 142 (21%) were culture positive. Whereas in clinically suspected cases admitted in ICU NONCOVID wards out of 304 samples organisms were isolated in 79 (26%) and 225 samples were sterile as shown in table no. 1

Out of total 221 blood stream infections 81 (36.6%) were hospital acquired infections and 128 were the blood stream infections present at the time of admission in hospital. Out of 81 blood stream infections commonest pathogen isolated was gram positive cocci. Among the gram positive cocci *Staphylococcus aureus* 28(34.5%) was most common followed by *Enterococcus* species 23(28.3%).Gram negative bacteria were, *Acinetobacter baumani* 12(14.8%) ,*Klebsiella pneumoniae* 9(11.1%)*Pseudomonas aeruginosa* 5(6.1%)and *E.coli* 4(4.9%) as shown in **Table no. 2**

Table no.2 shows isolation of organisms

1	<i>Staphylococcus aureus</i>	28	34.5
2	<i>Klebsiella pneumonia</i>	09	11.1
3	<i>Enterococcus species</i>	23	28.3
4	<i>Acinetobacter baumani</i>	12	14.8
5	<i>E. coli</i>	04	4.4
6	<i>Pseudomonas.aeruginosa</i>	05	6.1
	Total	81	

Among the 81 blood stream infections 43(53%) samples were from COVID positive cases ICU .Out of which 4(9.3%) patients were having insertion of central line for more than 2 days of hospital admission these were called as Central line associated blood stream infection (CLABSI) and 39(90.6%) patients were not having central line (Non CLABSI) as shown in **table no.3**

Table no.3 Showing organisms isolated in CLABSI and NONCLABSI in COVID positive wards.

Sr. no	Name of organisms	CLABSI	NONCLABSI	Total isolates in COVID positive
1	<i>Enterococcus species</i>	1	13	14
2	<i>Klebsiella pneumoniae</i>	0	7	7
3	<i>Staphylococcus aureus</i>	3	11	14
4	<i>Acinetobacter baumannii</i>	0	7	7
5	<i>E. coli</i>	0	1	1
Total		4	39	43

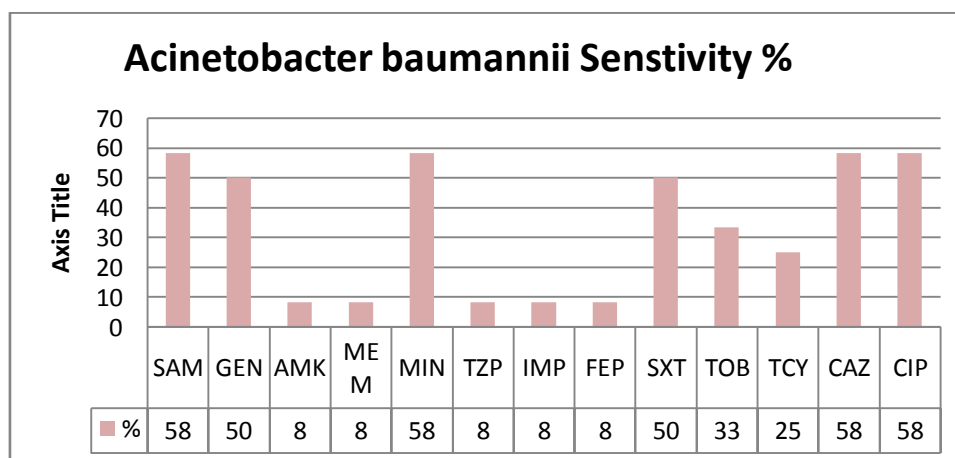
In table no.3 also shows predominance of gram-positive cocci than gram negative bacilli Methicillin resistant staphylococcus aureus (MRSA) was seen in 10 cases among the total 14 *Staphylococcus aureus*. The most gram-negative bacilli isolated were multi drug resistant.

Follow up of these patients in hospital was done. Out of 4(9.3%) CLABSI 2(50%) patients died due to Methicillin resistant staphylococcus aureus (MRSA). Mortality was observed in Staphylococcus aureus resistant to Cefoxitin and these patients were on Vancomycin. In total 39 patients who were not having central line (NON CLABSI) 16(41%) patients were discharged and 23(58%) patients death was noted.

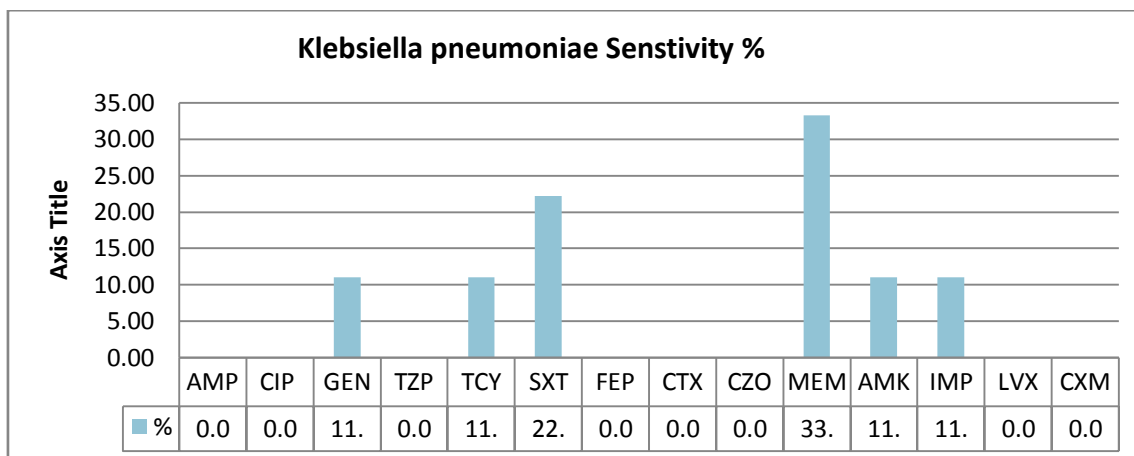
Table no.4 showing organisms in CLABSI and NONCLABSI in clinically suspected COVID ICU cases.

Sr.no	Name of organisms	CLABSI	NONCLABSI	Total isolates in clinically suspected cases	Percentage
1	<i>Staphylococcus aureus</i>	5	9	14	36.8%
2	<i>Enterococcus species</i>	0	9	9	23.6
3	<i>Pseudomonas aeruginosa</i>	0	5	5	13
4	<i>E.coli</i>	0	3	3	7.8
5	<i>Klebsiella pneumoniae</i>	0	2	2	5.2
6	<i>Acinetobacter baumannii</i>	2	3	5	13
Total		7	31	38	

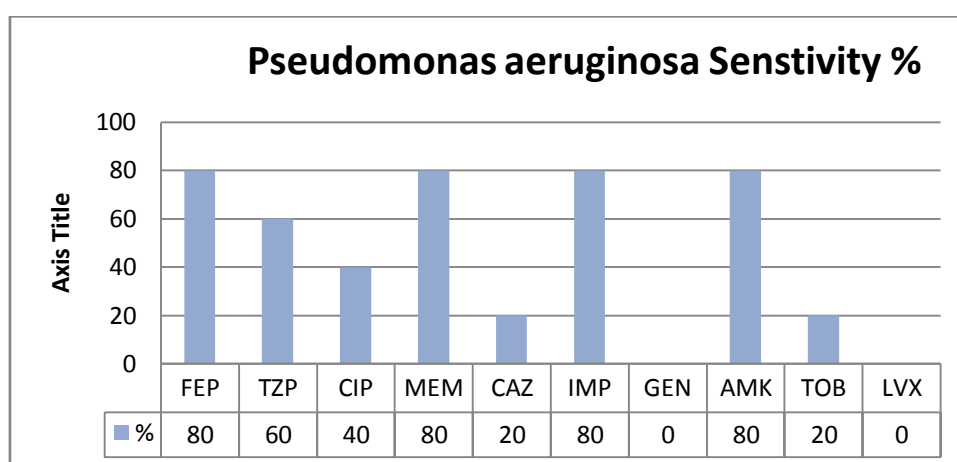
38 Blood stream infections were also noted in suspected ICU COVID cases wards as shown in table no.4 Out of 38 clinically suspected COVID cases blood stream infections 7 (18.4%) were having central line i.e CLABSI and 31 were not having central line. Among the 14 staphylococcus aureus patients were central line 9 samples were Methicillin resistant staphylococcus aureus (MRSA). Out of five Staphylococcus aureus one was methicillin resistant staphylococcus aureus (MRSA). When follow up these patients were done, out of 7 CLABSI patients one died was MRSA was isolated. In 31 NONCLABSI COVID negative cases in five patients death occurred.



Acinetobacter baumannii was found to be resistant to Carbapenems. Antibiotic sensitivity pattern is as shown above table. Most of the strains were sensitive to SAM, MIN, CAZ, CIP AND AMK.



Klebsiella pneumonia is found to be resistant to third generation Cephalosporins, Carbapenems and other drugs



Pseudomonas aeruginosa shows resistant to Gentamycin and Levofloxacin.

The most commonly gram-negative bacilli isolated were *Acinetobacter baumannii*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa* and *E. coli*. Among this *E.coli* shows 100% sensitivity to all antibiotics.

IV. Discussion

Overall prevalence of secondary blood stream infection in our study is 22.7% and in COVID ICU is 21%. Where as in clinically suspected cases it is 26% this might be because of critical illness and long stay of patients in ICU. Similar study was done by Garcia-Vidal et al (8). As our study include secondary blood stream infection after 48 hours of admission in hospital ICU. These infections are mainly hospital acquired infections, while the other authors could not make distinction between bacterial co-infections at the time of admission and secondary infections following hospitalization Rawson et al (1)

Majority (two-thirds) of patients who developed bacteremia in our study were critically ill and admitted in ICU. Early identification of bloodstream pathogens and their antibiotic resistance profile is necessary to improve clinical outcome as also shown by Kadri et al (9). All patients hospitalized in the ICU for at least two consecutive calendar days are monitored until their discharge from the ICU. Incidence of blood infections related with central lines (catheter-related bloodstream infections, CRBSIs) that occur after 48 h from the device insertion is registered. AS antibiotics are prescribed in suspected or documented COVID-19 for many reasons. Because of this it is difficult in ruling out bacterial co-infection and bacterial secondary infections.

In our study majority of secondary bacterial infections to viral infections are caused gram positive cocci which matches with study of Rice et al. Also in our study the hospital acquired infections due to gram negative bacteria were multidrug resistant. This is attributed to hospital flora which is usually MDRO.

V. Conclusion

Predominance of gram-positive cocci in COVID -19 patients with high rate of methicillin resistant staphylococcus aureus (MRSA) was noted. The most gram negative bacilli isolated were multi drug resistant. This gives the indication of improving infection control practices and usage of proper antibiotics for patient's benefits.

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