



Original Research Article

Incidence of secondary blood stream infections in Covid 19 (SARS-nCoV II.) patients

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ABSTRACT

Background: The symptomatology and severity of covid-19 ranges widely depending on stage of infection. Most of the patients with mild to moderate disease can be managed without hospitalization. The patients with risk factors are likely to progress to severe disease. Patients developing secondary blood stream infections require longer hospital stay and are likely to develop fatal disease. The antibiotic selection is key to successful treatment of secondary BSI. This is cross-sectional study of 166 COVID 19 patients admitted to ICU of Parul Sevashram Hospital who developed sepsis like syndrome and were subjected to blood culture.

Materials and Methods: Blood cultures were performed of all the patients developing sepsis like syndrome. IDSA guidelines were followed during blood collection for culture. Blood cultures were monitored on automated blood culture system. ID and susceptibility of all the isolates were performed on automated system (VITEK 2).

Results: A total of 1915 patients were reported RT-PCR positive for SARS nCoV2 during the period of 1st March2020 to 30 October 2020. 452 patients needed hospitalization based on their Oxygen saturation and co-morbidities. Out of 452, 166 patients developed sepsis like syndrome and were subjected to blood culture. The Blood culture positivity was 37/166 (22.28%). Gram positive bacteria were found in 48.64% while gram negative bacteria were 43.24%. The Enterococcus was the most common Gram positive bacterial isolates in patients. Candida was isolated in 2/37 positive blood cultures. Gram negative bacteria were isolated mostly amongst those patients who were on Ventilator. Most of the Gram positive bacteria were sensitive to Clindamycin, Linezolid, Vancomycin, Daptomycin and Teicoplanin.

Conclusion: The incidence rate of BSI was high. Early secondary blood stream infections were mostly endogenous. Enterococcus was the most common amongst Gram positive bacteria. Gram negative secondary bacterial infections were more common with patients on ventilator. The susceptibility pattern would help in decision making of empiric antibiotic therapy. Interestingly as described by some authors earlier the relationship between SARS nCoV 2 and Enterococci needs to be studied further.

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1. Introduction

The pandemic spread of Covid 19 has posed a great challenge to health-care system globally. The symptoms and severity of Covid 19 varies from asymptomatic infections to severe illness leading to death in some cases. Many of the patients require oxygen supplementation and some need mechanical ventilation. Antibiotics are not indicated in early

course of the disease. Blood stream infection may occur in later course of the disease especially the severely ill and patients on mechanical ventilators. Some patients develop sepsis like the syndrome which is similar to bacterial sepsis. Information regarding secondary blood stream infections in Covid 19 patients is scarce and variable. Low rate has been reported in patients with Covid 19 during hospitalization.

The chances of secondary blood stream infections increases after admission to ICU.2 Additionally antimicrobial resistance is a matter of concern once

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the patient is admitted to ICU. Typically many patients in later stage of the disease in Covid 19 develop sepsis like syndrome with cytokine storm. Aetiology of the sepsis sometimes could be a secondary blood stream infection and timely detection of the same can help appropriate antimicrobial therapy and reduction in secondary BSI related complications. Positive Blood culture would always represent true infection from colonization.

We propose to undertake a cross-sectional study to find the common causative agents of blood stream infections in Covid 19 patients admitted to ICU of tertiary care hospital. We also propose to study antibiotic susceptibility pattern of these isolates. This kind of study may reveal the actual incidence of secondary blood stream infections and will guide about the empiric antimicrobial therapy based on the common isolated and their AST to reduce complications and probable mortality. This can also be used to prevent such infections by prescribing prophylactic antibiotic therapy. As part antibiotic stewardship this study will help in reducing unnecessary use of broad-spectrum antimicrobial agents.

2. Materials and Methods

The present cross-sectional study was carried out at tertiary care hospital of PSH, Waghodiya, Vadodara from 1st March 2020 to 30th October 2020. During this period a total of 1915 confirmed cases were reported based on RT-PCR test for Covid19 performed on nasopharyngeal and oropharyngeal swabs. 420 patients needed hospitalization based on their clinical illness severity and laboratory investigations. According to sequential Organ Failure Assessment (SOFA) score, 166 patients developed sepsis like syndrome and were subjected to blood culture.

The objectives of studies are as following: 1. To know the incidence of secondary blood stream infection in Covid 19 patients. 2. To study the predominant etiological agents involved in blood stream infection in Covid 19 patients. 3. To study the pattern of antimicrobial susceptibility to predict empirical treatment.

2.1. Inclusion criteria

Record of blood culture and Laboratory parameters of all age group patients RT PCR positive for Covid-19. (Data from Central Laboratory of PSH).

2.2. Exclusion criteria

Record of blood culture and Laboratory parameters of Patients having illness other than covid-19.

2.3. Study type

Cross sectional study using retrospective and prospective secondary data available from lab reports.

3. Study duration

6 month.

3.1. Sample size

166 calculated by Epitools Software.

Blood culture and Antibiotic susceptibility of all age group patients RT PCR/Antigen positive for Covid-19 will be considered which are performed at central laboratory of PSH. The blood culture specimens will be collected from two different sites at an interval of minimum of 1 hour. Blood cultures are done as standard protocol on automated blood culture system, Bact/Alert for continuous monitoring. The culture medium used in blood cultures system supports growth of aerobic bacteria as well as fungi. The positive blood culture will be inoculated on different media as standard protocol. Identification and antimicrobial susceptibility of isolates will be performed on automated system-VITEK 2.

4. Results

Table 1: Showing the culture positivity (No. of cases 166)

Total number of Sample	Growth	No Growth
166(100%)	37 (22.28%)	129 (77.72%)

Table 1 shows that: Out of 166 (100%) samples, we got growth in 37 (22.88%) samples and no growth in 129 (77.72%) samples.

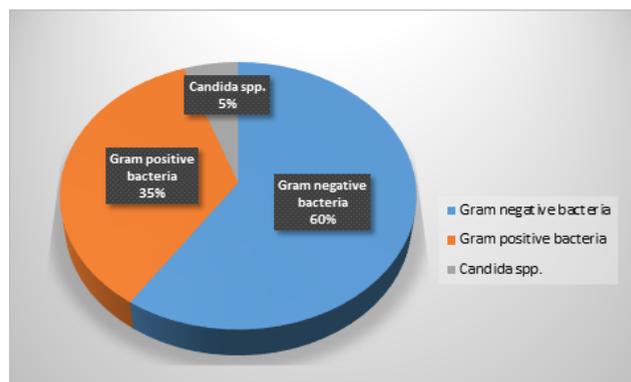


Fig. 1: Growth of pathogen with respect to culture positivity (%)

Table 2: Showing study of age distribution (No. of cases –166)

Group	No. of cases	Percentage (%)
M	126	75.90%
F	40	24.10%
Total	166	100%

Table 2 shows that predominance of male gender (75.90%) of patients were affected, where 24.10% female

were affected.

Table 3: Showing various Gram positive organisms isolate from blood culture (No. of cases-166)

Organisms isolated	No. of isolates	Percentage (%)
Staphylococcus hemolyticus	5	23%
<i>Enterococci faecum</i>	8	23%
<i>Enterococci fecalis</i>	2	18%
<i>Enterococci gallinarum</i>	3	14%
Total	18	48.64%

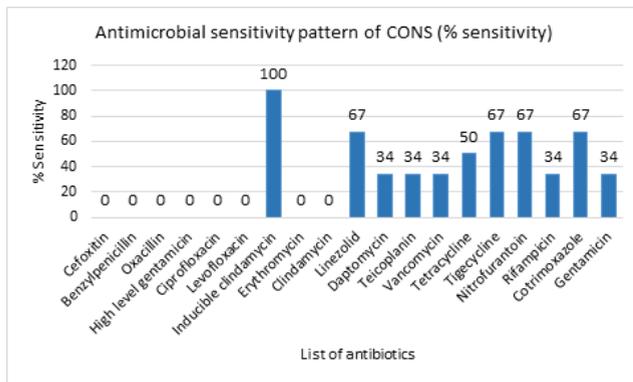


Fig. 2:

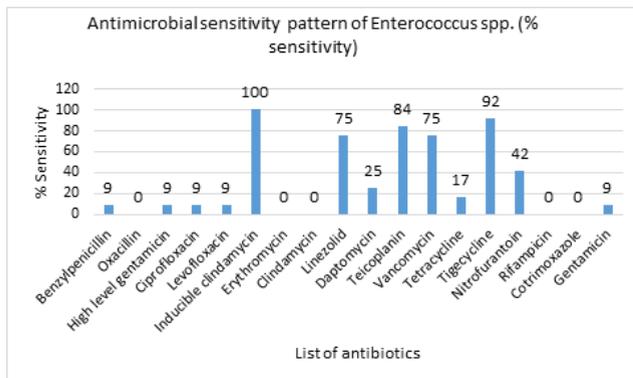


Fig. 3:

5. Discussion

Patients with severe covid 19 are likely to develop sepsis like syndrome with cytokine storm. The secondary blood stream infection in such patients may result in longer hospital stay and poor prognosis. The risk factors for acquisition of secondary blood stream infection can vary amongst the patients depending on the individual co morbid conditions as well as ongoing drug treatment. As many patients are subjected to steroids for immune suppression to prevent

Table 4: Showing Gram negative organisms isolated from blood culture (No. of cases-166)

Organisms isolated	No. of isolates	Percentage (%)
Klebsiella pneumonia	3	23%
Acinetobacterspp	2	15%
Escherichia coli	6	46%
Pseudomonas spp	1	8%
Acromobacter xylosoxidans	2	15%
Aerococcusviridans	1	8%
Kocuriarosea	1	8%
Total	16	43.24

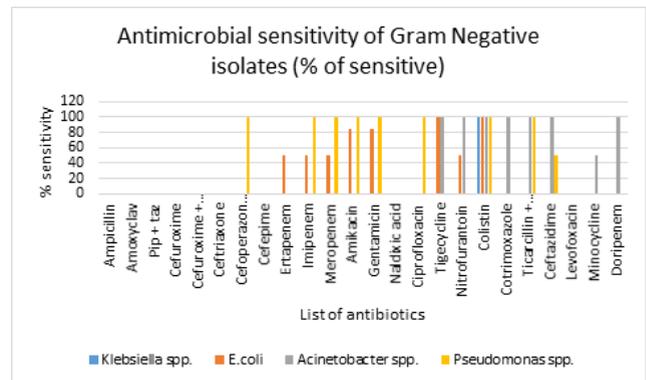


Fig. 4:

Table 5: Showing Yeast isolated from blood culture (No. of cases-166)

Organisms isolated	No. of isolates	Percentage (%)
Candida Tropicalis	3	1.81%
Total	3	1.81%

cytokine storm the chances of secondary infections rise. The incidence of secondary bacterial infections reported from different countries varies.

In a study done by Daniel Roberto et al., the incidence of secondary BSI was 0.9% to 7.7% 3. Compared to this our study shows a higher incidence of secondary blood stream infection that is 22.28%.

The study done by Denia et al. also indicates higher incidence of Gram positive bacterial sepsis in Covid 19 patients. 3 In the same study they have reported higher prevalence of secondary blood stream infections due of Enterococcus species because of their intrinsic resistance against routine prophylactic third generation cephalosporins. Gram positive organisms. Similar result was found by Bonazzett.¹⁻⁴

Enterococci spp were isolated in 13/18 Gram positive cocci isolates. Of the 13 Enterococcus spp, Enterococcus faecium (8), Enterococci fecalis(2), Enterococci gallinarum(3) in our study. Staphylococcus

hemolyticus was isolated in 5/13 Gram Positive organisms. The antibiogram for the Gram positive bacteria suggest sensitivity to Clindamycin, Leinezolid, Daptomycin, Teicoplanin and Vancomycin.

Gram negative secondary blood stream infection rates in our study was 43.24%. The incidence of gram negative sepsis was found to be more amongst patients on Ventilator. Among Gram negative bacilli E.coli (6/16) followed by Klebsiella pneumonia (3/16), Acinetobacter spp (2/16) and Pseudomonas spp.(1/16). The uncommon organisms were Acromobacter xylosoxidans (2/16), Aerococcus viridace (1/16) and Kocuria rosea (1/16). The Klebsiella and Acinetobacter spp. Isolates were multidrug resistant.

Vandsala Baskaran found limited evidence for community-acquired bacterial co-infection in hospitalised adults with COVID-19, but a high rate of Gram-negative infection acquired during ICU stay, consisting largely of Gram-negative bacteria, particularly Klebsiella pneumoniae and Escherichia coli.⁵

Bacterial, fungal and viral co-infections and superinfections in hospitalized patients with COVID-19 are low; however, when present, they may cause severe diseases with worse outcomes. S. pneumoniae and S. aureus are the most common pathogens to cause community-acquired pneumonia co-infections. In our area, P. aeruginosa and E. coli were frequent bacteria that caused hospital-acquired superinfections.⁶

Candida tropicalis (2/37) was isolated in two patients and was susceptible to all available antifungal agents. Antinori and coworkers reported high rate of candidemia (6.9%) among 43 patients.⁷

6. Conclusion

Covid 19 has complex disease pathogenesis. Patients on immunosuppressive therapy are at risk of developing secondary blood stream infections. Initially most of the secondary BSI were endogenous as Enterococcus spp was most prevent organisms. Patients admitted to the ICUs are also at risk of developing nosocomial infections. The patients on mechanical Ventilator are at risk of Ventilator associated infections. Gram negative organisms were more common in VAP.

The study will guide in selection of antibiotic during secondary blood stream infections depending the stage of

the disease. As a part of antibiotic stewardship, the study will help in reduction of unnecessary use of antimicrobial agents.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare that there is no conflict of interest.

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