



PROFILE AND INCIDENCE OF SECONDARY INFECTIONS IN POST COVID PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

The secondary infections caused by COVID-19 pandemic has raised concerns because of limited treatment options and empiric antimicrobial treatment posing serious risks of aggravating antimicrobial resistance (AMR). Although there are many studies suggesting that COVID 19 patients are predisposed to secondary infections, limited data on their prevalence especially in India is available. This study was conducted to study the prevalence and profiles of co- & secondary infections in patients at the COVID-19 facility in South India. We studied the profile of 248 samples of patients clinically suspected to have secondary infection and processed by conventional microbiological methods. The overall prevalence in our study was found to be 2% with gram negative isolates dominating. The most common pathogen isolated was *Pseudomonas aeruginosa*. Although the secondary infection rate is 12%, the high resistance pattern seen among the isolates is the matter of concern in our study.

KEYWORDS : Covid 19, secondary infections, co infections antimicrobial resistance.

INTRODUCTION:

The COVID-19 pandemic which is ongoing worldwide, caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus had a great impact on health care system and economy of many countries including India¹. Just like other viral pneumonias, bacterial and fungal infections are common complications seen in hospitalized COVID-19 patients². This is due to the immunological inability of the host to clear bacterial pathogens due to impaired release of specific cytokines like IL-10, IL-6, IL-17 and IL-23. The covid 19 infected patient also have reduced dendritic cells function, decreased macrophages, natural killer cells, CD4+ and CD8+ T-cells and also certain phagocyte-independent mechanisms by which virus infection may facilitate secondary bacterial infection³. But the initial studies on covid 19 did not report on the occurrence of co-infections or secondary infections, even though it noted a very low rate was reported. This is because of the implementation of early guidelines for COVID management recommending early use of antibiotics (within 1 h of presentation) in all suspected COVID-19 cases on identification of sepsis³.

Secondary infections in COVID-19 patients are known to be associated with negative health outcomes. The mortality increased to 9.8% in covid patients with secondary infections. As per recent studies, secondary bacterial infections following hospitalization, occurred in up to 15% of the covid 19 patients⁴. Clinical uncertainty is likely to drive unnecessary antimicrobial prescribing in COVID-19 patients both on and during admission, potentially increasing the selection of drug resistant infections.

The studies reporting incidence and profile of bacterial and fungal infection in COVID-19 is limited⁵. Hence the present study is aimed to determine the incidence of secondary infections and the antibiogram pattern in covid 19 infected patients.

MATERIALS AND METHODS:

This is an observational retrospective study performed in a tertiary care 500 bedded hospital during 6 months period between January 2021 to June 2021. All the patients with age >5yrs who were tested positive for covid 19 on RTPCR (reverse transcriptase) performed on nasopharyngeal specimens and all the patients >5yrs of age fulfilling the clinical criteria given by WHO during that period were included in the study. The clinical samples like sputum, respiratory samples, urine, blood and pleural fluid from the covid 19 positive patients showing signs and symptoms of infection were collected and further processed upon the request of physician by conventional microbiological methods. The antibiotic

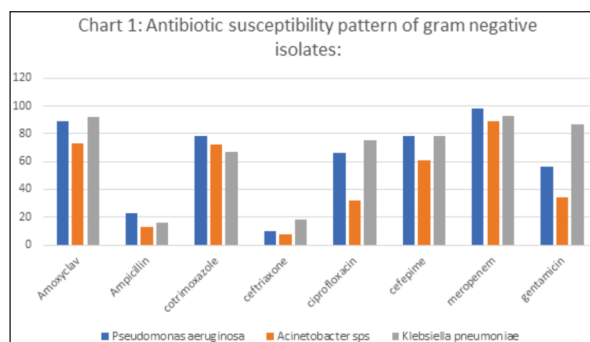
susceptibility pattern was determined by Kirby bauer disc diffusion method.

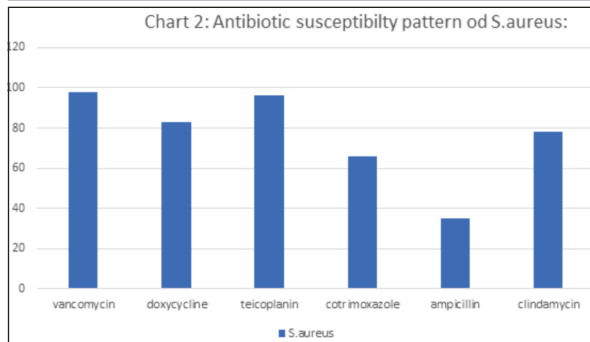
RESULTS:

A total of 3120 patients were admitted during the study period. Out of these 507 patients were tested positive for covid. Out of them 75% (n=) were males and 25%(n=) were females. Among these the overall incidence of secondary infection was 12%(63/507). A total of 248 samples of the patients suspected to have secondary infections were received for microbiological culture of which 193 (78%) were sputum, 29 were bronchoalveolar lavage (12%), 19(8%) were sterile fluids and 5 (2%) were blood samples. Out of these 63 samples were culture positives of which 47 were males and 16 were females. Of the pathogens isolated, Gram-negative bacteria were the predominant pathogens 95%(n=60). The most commonly isolated pathogen was *Pseudomonas aeruginosa* 62%(n=39). The other gram negative isolates were *Acinetobacter baumannii* 23%(n=14) and *Klebsiella pneumoniae* 10%(n=6). The gram positive pathogen isolated was *Staphylococcus aureus* 5%(n=3). No fungal infections were identified in our study.

Table 1: Sample wise distribution of the isolates obtained:

	<i>Pseudomonas aeruginosa</i> (n=39)	<i>Acinetobacter baumannii</i> (n=14)	<i>Klebsiella pneumoniae</i> (n=6)	<i>Staphylococcus aureus</i> (n=3)
Sputum	31	9	2	1
Broncho alveolar lavage (BAL)	4	0	2	0
Sterile body fluids	3	3	1	0
Blood	1	2	1	2





80% Of gram negative isolates were resistant to cephalosporins and more than 90% of gram negative isolates are sensitive to carbapenems. Most of the gram positive isolates were resistant to ampicillin and more than 95% of gram positive isolates were sensitive to vancomycin.

DISCUSSION:

The evidence as shown by various studies done globally in high covid areas suggested that secondary infections are common. Two meta- analyses published so far from COVID-19 patients documented rates of bacterial co-infections as 3.5% and 7%, respectively^{5,6}. In a study done by S. Khurana et al. in New Delhi, secondary infection rate was found to be 13%¹. In the present study secondary infection rate was found to be 12% .This is similar to other studies done in India which reflects the high impact of covid 19 in the country.

45% of the total number of patients reporting secondary infections, were identified after 48 hours of hospitalization. Although this is suggesting role of Hospital acquired infection (HAI's), a distinction between co- infections at the time of admission and secondary infections following hospitalization could not be made. Similar scenario was also seen in a review done to compare usage of antibiotics and coinfections developed in covid 19 patients^{2,7}.

Sputum and respiratory samples were the most common sites of secondary infection in COVID-19 patients in the present study. Gram- negative pathogens were predominant in respiratory infections, with a significant proportion of Gram-positive pathogens isolated from bloodstream infections. This is similar to a study done by Vijay et al in hospitalized covid patients².

In a study done by S. Khurana et al and Vijay et al. gram-negative pathogens were predominant with *Klebsiella pneumoniae* being the most common isolate^{1,2}. In our study *Pseudomonas aeruginosa* is the most common isolate (62%) with gram negative organisms predominating.

S. Khurana et al and Vijay et al. identified fungal infections in their studies with *Candida auris* being the predominant fungal isolate. Although in our study no fungal isolates were identified^{1,2}.

In our study most of the gram negative isolates were multidrug resistant with reduced sensitivity to higher antibiotics .This emphasizes the inadvertent use of antibiotics in hospitalized patients along with other factors like prolonged ventilation, hospital stay resulting in emergence of drug resistance.

Our study could not access the association between coinfection and increased risk of death as seen in other studies that have shown a positive association between coinfection or superinfection and increased risk of death among patients with the SARS-CoV-2 infection. This is due to the failure in procuring entire data due to incomplete follow up all the subjects in the study. Although a positive association is

seen between comorbidities and coinfection in covid patients. Our study has few limitations like not considering viral infections that could occur as coinfections. Identification of viral coinfections are important particularly for influenza because clinical presentation of influenza and SARS-CoV-2 is similar and lab diagnosis is the major clue in existence of coinfections and superinfections.

CONCLUSION:

Based on prior respiratory viral pandemics with influenza, concerns were initially raised regarding the potential for high rates of bacterial and fungal co-infection, often associated with high mortality. It is important to understand the secondary infection associated with covid 19 to reduce the mortality. Gram negative isolates are predominantly associated with covid associated secondary infections. Inadvertent use of antibiotics during covid 19 pandemic lead to the emergence of drug resistant isolates. Control of patient factors such as length of mechanical ventilation, use of immunosuppression, and line days and institutional factors such as the number of COVID-19 cases, staffing during the pandemic play an important role in prevention.

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