RESEARCH ARTICLE

BACTERIAL SPECTRUM AND THEIR ANTIBIOGRAM AMONG SPUTUM SAMPLES DURING COVID-19 PANDEMIC AT A TERTIARY CARE HOSPITAL

Dr. Nimmala Sri Harsha[1], Dr. Srivani, N., [2]Dr. Rajaram, G.[3]

[1]Post Graduate, Department of Microbiologyn, S.V. Medical College, Tirupati
[2]Assistant Professor Department of Microbiology, S.V. Medical College, Tirupati
[3]Associate Professor Department of Microbiology, S.V. Medical College, Tirupati

ABSTRACT

Introduction: Respiratory tract infections are most frequent of all infections and lower respiratory tract infections are most common worldwide. Immunity plays a significant role in an individual's defense mechanism against infections. Once immunity specifically innate immunity is affected, people will be more prone for infections especially bacterial infections. Covid-19 pandemic is exhibiting waves of peaks during different months. Bacterial coinfections during viral pandemics are one of the challenges for the health care professionals. *Material and Methods:* This is a Retrospective study conducted in the department of microbiology S.V. Medical College, Tirupati during January 2021 to June 2021, approved by scientific committee. Total 382 sputum samples were included among which Males were 284 and Females 98. 218 (57%) samples yielded bacterial growth. Laboratory diagnosis was done by routine conventional methods with antibiogram by Kirby Bauer disc diffusion method. Most common organism isolated was Streptococcus pneumoniae followed by Klebsiella, enterobacter, Serratia, S.aureus. ESBL producing Enterobacteriaceae and MRSA were also isolated. *Results:* In the present study, out of 382 sputum samples, 218(57%) were culture positive and 164(43%) were sterile. Culture positivity was more in the age group of 56-65years. Commonest organism isolated was Streptococcus pneumoniae. Maximum susceptibility shown to cefoperazone –sulbactum, imepenem. *Conclusion:* As there is increase in prevalence of multi drug resistant organisms were observed, routine culture, antibiogram should be done. Implementation of changes in the local antibiotic policies according to the antibiotic susceptibility testing is needed.

INTRODUCTION

Following viral infections, altered epithelial cells that disrupt the mucociliary clearance and mucus thickening impairing the movement of immune cells. In particular setting of SARS-CoV-2 infection fluid and pus filled pulmonary alveoli create a nutritive environment for bacteria such as *Pseudomonas aeruginosa* and *Staphylococcus aureus*

Aims and Objectives: This study is conducted to determine the bacterial spectrum and antibiotic pattern from the sputum samples during covid-19 pandemic and to study the antimicrobial sensitivity pattern of the Bacterial isolates.

MATERIALS AND METHODS

This cross-sectional study was conducted from January 2021 to June 2021 (6 months) in Dept.of Microbiology, Sri Venkateswara Medical College, Tirupati, after obtaining permission from the Institutional Ethical committee.

The Sputum samples received from various clinical departments are Processed according to standard guidelines. Direct Grams staining done, Cultured on Blood agar and Mac Conkey agar. Isolates were identified by appropriate biochemical reactions. Antimicrobial susceptibility testing was done by Kirby-Bauer Disc diffusion method, Using Cefoxitin (30mcg), Methicillin Resistance in *Staphylococcus aureus* was determined. Further Using Ceftriaxone (30mcg), Aztreonam (30mcg), and Ceftazidime – Clavulanate (30/10), ESBL producing Enterobacteriaceae were detected

Sample collection: Various sputum samples during COVID 19 pandemic with suspicion of bacterial infection are collected using spontaneously from patients by coughing up into wide mouthed sterile container and by sputum induction by inhaling a mist and deep coughing into container, also bronchoscopy specimens and also by gastric washing in patients in whom obtaining sputum sample is difficult. And are immediately sent to the laboratory for further processing.

RESULTS

A total of 382 sputum specimens were collected during the study period. Out of these, 284 (74%) were from males and 98 (26%) were from females. Among 382 specimens, 218 (57%) were culture positive
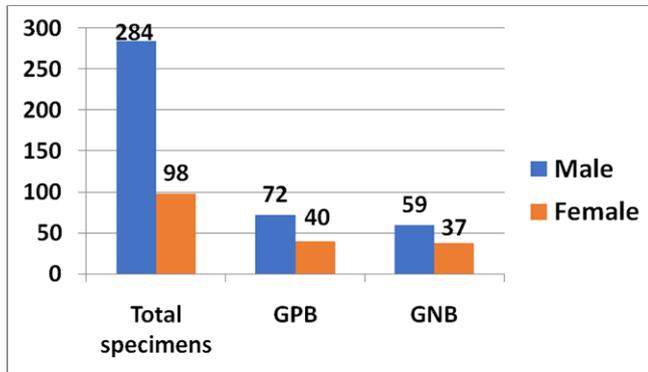

Table 1. Gender-wise distribution of specimens

Table 2. Age-wise distribution of the study isolates

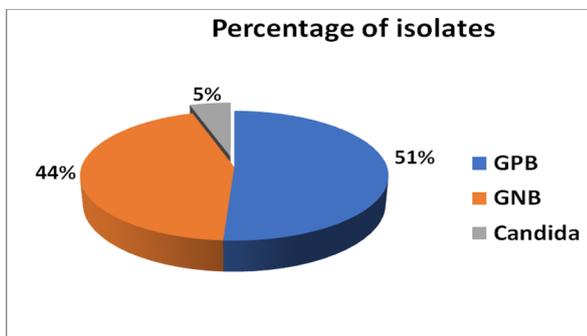| Bacterial isolates	5-15	16-25	26-35	36-45	46-55	56-65	66-75	>75
S.pneumonie	2	12	10	17	20	20	13	2
S.aureus	2	3	1	1	3	5	1	-
K.pneumoniae	3	1	7	8	13	9	9	3
A.baumanni	-	1	4	3	3	2	1	-
P.aeruginosa	-	2	-	-	1	8	1	-
E.coli	-	2	1	3	3	2	1	-
*Proteus*spp	-	-	-	2	3	1	-	-
*Moraxella*spp	-	-	-	1	-	-	-	-
TOTAL	7	21	23	35	46	47	26	5

Table 3. Frequency of isolates (n=218)

Table 4. Distribution of isolates by gender (n=208)

BACTERIAL ISOLATES	MALE	FEMALE	TOTAL NO (%)
Streptococcus pneumoniae	63	33	96 (46.2)
Klebsiellapneumoniae	32	21	53 (25.5)
Staphylococcus aureus	9	7	16 (7.7)
*Acinetobacter*spp	9	4	13 (6.25)
Pseudomonas aeruginosa	9	3	12 (5.76)
Escherichia coli	8	3	11 (5.28)
Proteus spp	1	5	6 (2.9)
Moraxella spp	0	1	1 (0.48)

Table 5. Sensitivity pattern of Gram positive bacterial isolates

Antibiotics	*S. pneumoniae*(n= 96)	*S. aureus* (n = 16)
Ampicillin	77(80%)	13 (81%)
Cefoxitin	NA	13 (81%)
Cotrimoxazole	79 (82%)	12 (75%)
Erythromycin	85 (88%)	13 (81%)
Cefoperazone-sulbactum	96 (100%)	15 (93%)
Penicillin	67 (70%)	12 (75%)
Vancomycin	NA	16 (100%)

Table 6. Sensitivity pattern of Gram negative bacterial isolates

Antibiotics	K.pneum (n-=53)	A. baum (n=13)	Ps. aeru (n-12)	E. coli (n=11)	Proteus (n=6)	Moraxella (n=1)
Ampicillin	NA	46%	NA	73%	33%	100%
Ceftriaxone	94%	69%	75%	91%	83%	100%
Amikacin	74%	77%	83%	91%	83%	100%
Azithromycin	89%	54%	75%	63%	50%	100%
Cotrimoxazole	79%	46%	NA	63%	NA	NA
Levofloxacin	90%	31%	75%	73%	67%	NA
Aztreonam	90%	85%	NA	100%	83%	NA
Cefoperazone-sulbactum	81%	85%	NA	100%	100%	100%
Imipenem	96%	92%	100%	100%	83%	100%

Table 7. Frequency of drug resistant isolates

Drug resistance	Frequency (%)
Methicillin resistant *S.aureus* (n=16)	3 (19)
ESBL producing *K.pneumoniae* (n=53)	6(11)

DISCUSSION

In the Present study, 382 sputum samples were collected and processed, among which 218 samples showed culture positivity. The age group predominantly affected in the present study is 56 to 65 years (22%) which correlates with the study conducted by Fei He *et al* (43%) The males (60%) were more predominantly affected compared to females in the present study. This correlates with the study by FeiHe atal (54%) and Salman Khan *et al* (28%).Among the 218 culture positive isolates, *Streptococcus pneumonia* (44%) was predominant in the present study, which is similar to the study by Salman Khan *et al* (52%).Among the Gram negative bacteria, *Klebsiellapneumoniae* (24%) was predominant in the present study which coincides with the study conducted by Ullah Borkot *et al* (8%)Among the GPB, highest sensitivity was seen towards , Cefoperazone-sulbactum (100%) and least sensitivity to Penicillin. Among the GNB isolates, highest sensitivity were noted towards Ceftriaxone (85%), Cefoperazone-sulbactum (93%)and Amikacin. This correlates with the study conducted by Salman Khan *et al*. The ESBL producing Enterobacteriaceae isolates were 100% sensitive to Amoxcillin – Clavulanate, but the susceptibility to Ceftriaxone (94%) and Aztreonam (90%). This correlated with the study by Dinesh Kumar *et al*.

CONCLUSION

As there is raised prevalence of MDR organisms among the clinical isolates, it is mandatory to perform culture and antimicrobial sensitivity testing before initiation of antibiotics. This can be achieved by implementing appropriate antimicrobial stewardship programme in the hospital settings.

Limitations: The genotyping study of the MRSA isolates and ESBL producing Enterobacteriaceae organisms were not done in the present study.

REFERENCES

1. He F, Xia X, Nie D, Yang H, Jiang Y, Huo X, Guo F, Fang B, Hu B, Jiang H, Zhan F, Lv J. Respiratory bacterial pathogen spectrum among COVID-19 infected and non-COVID-19 virus infected pneumonia patients. DiagnMicrobiol Infect Dis. 2020 Dec;98(4):115199. doi:

10.1016/j.diagmicrobio.2020.115199. Epub 2020 Sep 3. PMID: 32979617; PMCID: PMC7470696.

2. Ullah, Borkot& Ahmed, Sohel&Shahriar, Masum&Yesmine, Saquiba. (2016). Current Trend of Antibiotic Resistance in Lower Respiratory Tract Infections (LRTIs): An Experience in a Teaching Hospital in Bangladesh. Bangladesh Pharmaceutical Journal. 19. 85-91. 10.3329/bpj.v19i1.29243

3. Al-Azzam, Sayer&Mhaidat, Nizar& Banat, Hayaa&Alfaour, Mohammad & Ahmad, Dana& Muller, Arno & Al-Nuseirat, Adi&Lattyak, Elizabeth & Conway, Barbara &Aldeyab, Mamoon. (2021). An Assessment of the Impact of Coronavirus Disease (COVID-19) Pandemic on National Antimicrobial Consumption in Jordan. Antibiotics. 10. 690. 10.3390/antibiotics10060690.

4. Tille, Patricia M., author.(2017). Bailey & Scott's Diagnostic Microbiology

5. Lucien MAB, Canarie MF, Kilgore PE, Jean-Denis G, Fénélon N, Pierre M, Cerpa M, Joseph GA, Maki G, Zervos MJ, Dely P, Boncy J, Sati H, Rio AD, Ramon-Pardo P. Antibiotics and antimicrobial resistance in the COVID-19 era: Perspective from resource-limited settings. Int J Infect Dis. 2021 Mar;104:250-254. doi: 10.1016/j.ijid.2020.12.087. Epub 2021 Jan 9. PMID: 33434666; PMCID: PMC7796801

6. d'Humières C, Patrier J, Lortat-Jacob B, Tran-dinh A, Chemali L, MaataouiN, *et al*. (2021) Two original observations concerning bacterial infections in COVID-19 patients hospitalized in intensive care units during the first wave of the epidemic in France. PLoS ONE 16(4): e0250728. doi:10.1371/journal.pone.0250728

7. Kumar D, Singh AK, Ali MR, Chander Y. Antimicrobial Susceptibility Profile of Extended Spectrum β-Lactamase (ESBL) Producing Escherichia coli from Various Clinical Samples. Infect Dis (Auckl). 2014 Mar 25;7:1-8. doi: 10.4137/IDRT.S13820. PMID: 24847178; PMCID: PMC4024053.

****