www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i8.09

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Original Article

Sputum Bacteriology and antibiotic Sensitivity Pattern in patients with COPD: A Hospital Based Study

Authors
Dr S.Soumya[1], Dr Manjula Vagarali, Dr Jyoti Nagamoti
Department of Microbiology, Jawaharlal Nehru Medical College, KLES Dr. Prabhakar Kore Hospital and Medical Research Center, KAHER, Belgaum, Karnataka, India.
Corresponding Author
Dr S.Soumya
Assistant Professor, Department of Microbiology, Jawaharlal Nehru Medical College, KAHER, Belagavi
Email: *soumya86.s@gmail.com*

Abstract
Background: *COPD is a major cause of mortality and morbidity which varies across countries and has emerged as the third leading cause of death. Most of the exacerbations are associated with infective causes like either virus or bacteria, although non-infective triggers like air pollution are important.*
Objectives: *To determine the bacteriology of COPD and to assess their antibiogram.*
Material and Methods: *A total of 176 sputum samples of clinically diagnosed patients of COPD received at the Department of Microbiology, J. N. Medical College, Belagavi, were investigated for sputum culture and drug sensitivity testing following standard microbiological protocol.*
Results: *Growth of pathogens was obtained in 54.97% of sputum samples. Gram negative bacilli (GNB) were the predominant etiological agents (62.76%). Among GNB, K. pneumoniae (49.15%) was the most common isolated organism followed by Pseudomonas aeruginosa (33.89%) and E.coli (11.86%). Piperacillin+tazobactum and Aminoglycosides were the most effective antibiotic against all organism. Cephalosporins and Quinolones were less effective. Gram positive cocci- Streptococci sp. being the predominate was isolated in 29.78% of the samples.*
Conclusion: *With continuously changing bacterial flora of COPD, choice of antibiotic should be based on the local bacterial resistance pattern. Periodic studies to identify probable agents and their antibiotic sensitivity pattern would assist in formulating a cost effective antibiotic strategy reducing the emergence of drug resistance.*
Keywords: *Sputum, COPD, Antibiogram, Bacteriology.*

Introduction

Chronic Obstructive Pulmonary disease (COPD) is defined as a common preventable and treatable disease characterized by persistent and progressive airflow limitation that is caused due to enhanced chronic inflammatory response of the airways and lungs to noxious particles and gases. COPD has emerged as the third leading cause of death and is a major cause of mortality and morbidity.[1,2]

Though COPD is a progressive illness, periods of remission and exacerbations are known. An exacerbation of COPD is defined as an event in the common course of the disease characterized by the change in the patient's baseline dyspnea, cough and / or sputum production that is beyond common day-to-day variations, which is acute in onset, and warrants a change in regular medications.[1] Severe exacerbations of COPD results in respiratory failure as the patients are unable to maintain normal blood gases. Mortality is found to be 10% in patients admitted to hospital with hypercarbic COPD exacerbation being the cause for it.[3,4] Exacerbations of COPD have serious negative impacts on patient's quality of life, lung function as well as socioeconomic costs.[5, 6, 7, 8] There are three class of pathogens which have been labelled as a cause of COPD exacerbation: respiratory viruses, atypical bacteria, aerobic gram positive and gram negative bacteria. Though the role of bacteria in COPD exacerbation is controversial, researchers have found that approximately 50% of COPD acute exacerbations are associated with the bacteria from lower respiratory tract. Although bacteria and viruses are the causes for exacerbation, air pollution is also a known cause apart from one-third of the cause for exacerbation being unidentified.[8]

Ways by which bacteria can lead to acute exacerbation include: a) primary infection of the lower airways. b) Secondary infection of the airway following viral infection. c) Bronchial hyper reactivity and eosinophilic inflammation induced by bacterial antigens.[9]

More than 90% of the COPD patients are treated with antibiotics even before the culture sensitivity report of the same being obtained. This indiscriminate use of antibiotic has led to the emergence of resistant strains to the commonly used antibiotics, resulting in irreversible progress of the disease.[10,11] Hence, timely institution of correct management is imperative for the better prognosis of the disease.

Objective

In view of the limited data about the bacteriological profile in COPD patients, present study was undertaken to identify the common aerobic bacteriological agents responsible for COPD exacerbation and to study the antibiotic sensitivity pattern of these isolates.

Material and Methods

A total of 171 sputum samples of clinically diagnosed patients of COPD were received at the Department of Microbiology, J. N. Medical College, Belagavi and were investigated for sputum culture and drug sensitivity testing following standard microbiological protocol.

Gram staining of all the sputum samples was done and were evaluated based on Bartlett's grading system and a score was given.[12]

Bartlett's grading system

Number of Neutrophils /10 X LPF	**GRADE**
<10	0
10-25	+1
>25	+2
Presence of mucus	+1
Number of Epithelial Cells /10 X LPF	
10-25	-1
>25	-2
Total score	

Average number of epithelial cells and neutrophils in 20-30 LPFs was calculated and the total score arrived at. A final score of 0 or less indicated lack of active inflammation or contamination (non-acceptable sample), and a score of 1 and above was considered an acceptable sample.

Sputum samples were inoculated on Blood agar and MacConkey media. All the organisms isolated were identified by their morphology, culture characters & biochemical reactions following standard protocols. Antibiotic sensitivity testing was done by Kirby Bauer Disk Diffusion method & results were interpreted according to CLSI guidelines.[13,14]

Results

A total of 176 sputum samples were processed. Sputum culture positivity was observed in 166

cases (54.97%), as shown in fig 1. Collectively, Gram negative bacilli (GNB) were the predominant etiological agents (62.76%). Among GNB, K.pneumoniae (49.15%) was the most common isolated organism followed by Pseudomonas aeruginosa (33.89%) and E.coli (11.86%) as depicted in fig 2. Piperacillin+tazobactum and Aminoglycosides were the most effective antibiotic against all organism. Cephalosporins and Quinolones were less effective. Gram positive cocci- Streptococci sp. being the predominat was isolated in 29.78% of the samples. Fig 3, 4, 5 and 6 are showing the resistant pattern of Klebseilla sp, Pseudomonas aeruginosa, Strep pneumoniae and Strept pyogens respectively.

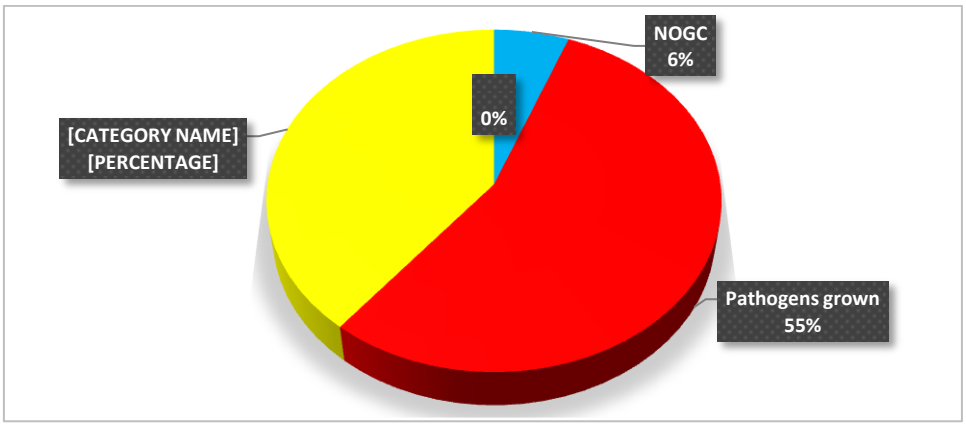

Fig 1: Culture growth distribution

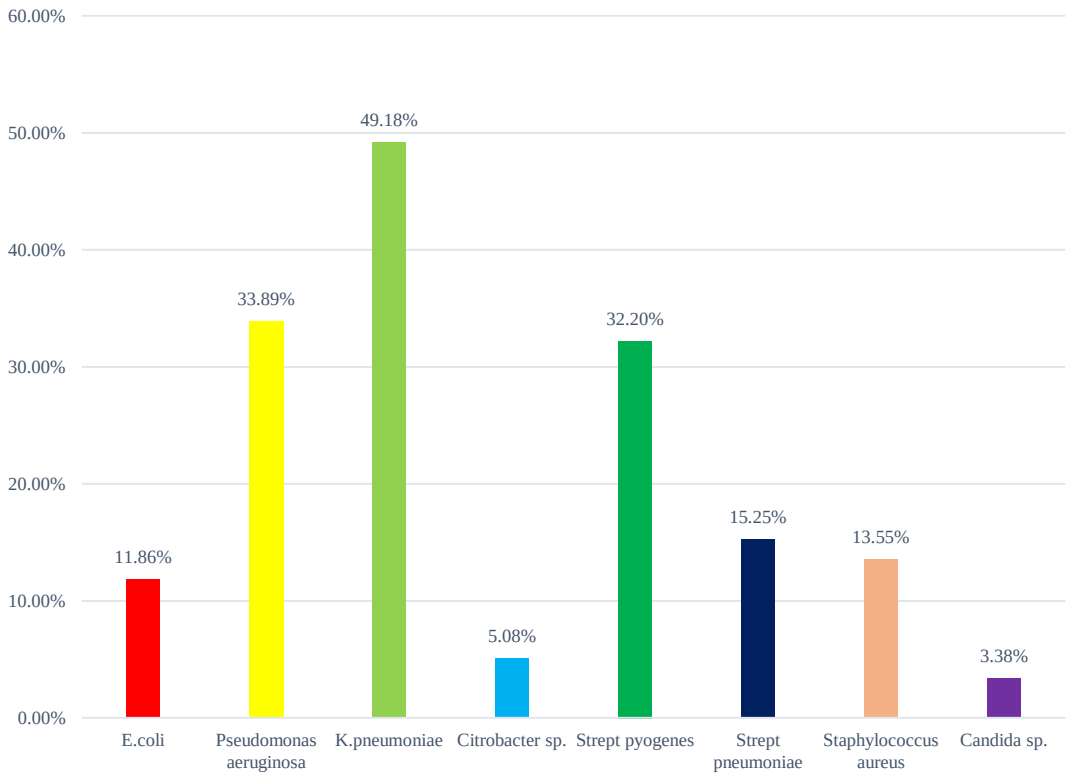

Fig 2: Distribution of various bacterial organisms isolated

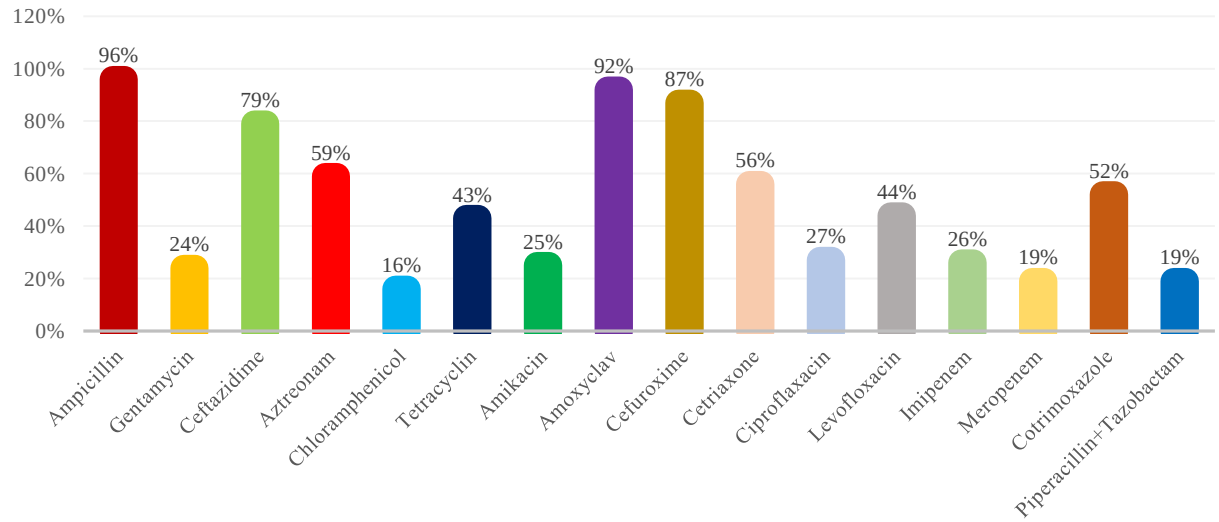

Fig 3: Resistance pattern of Klebseilla species.

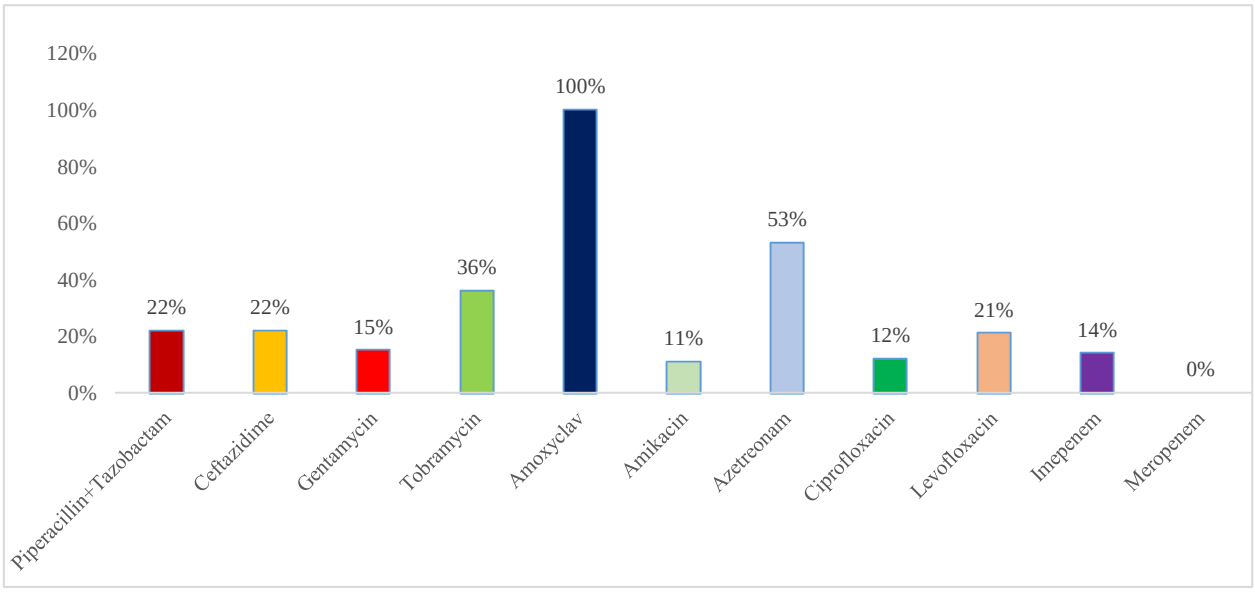

Fig 4: Resistance pattern of Pseudomonas aeruginosa

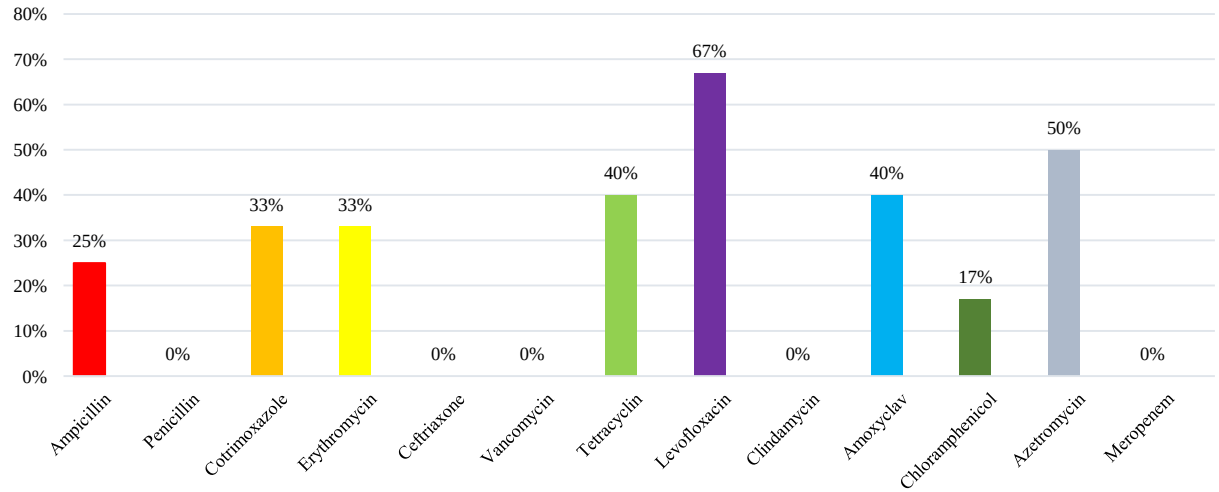

Fig 5: Resistance pattern of Streptococcus pneumoniae

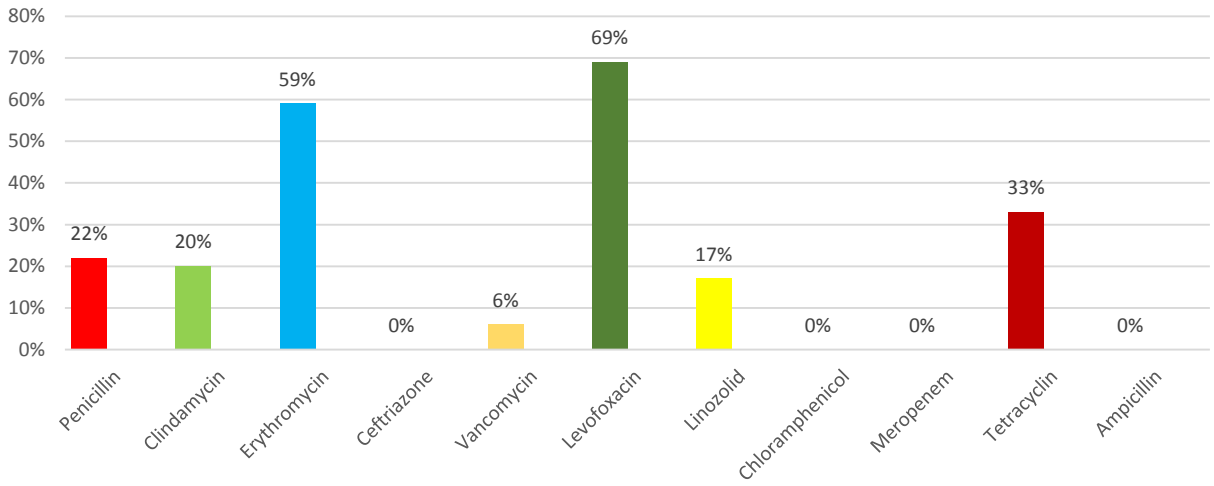

Fig 6: Resistance pattern of Streptococcus pyogenes

Discussion

COPD is a leading cause of mortality and morbidity. Episodes of exacerbation add to the burden of the disease and are the major cause for health are utilization including hospitalizations and intensive care admissions. Most of the exacerbations are associated with infective causes like either virus or bacteria, although non-infective triggers like air pollution are important.[1,15] Since sputum culture facilities are either not available or are adequately utilized or time consuming, it is better to know the pattern of bacterial flora and their antibiotic sensitivity pattern of a particular geographical area.[16]

Sputum culture was positive in 54.97% of patients with COPD. Similar frequency of bacterial isolation in sputum of patients of COPD has been reported by P. Sharma et al; H.Sharan et al and K. Chawala et al.[2,17,18]In our study K.pneumoniae was found to be the most common sole bacterial agent responsible for COPD excarabtion. Our finding of K.pneumoniae as the most common agent is in concordance with study results of K.Chawala et al; and S.Madhavi etal;[18,19] while few other studies done by P. Sharma et al; and Patel AK et al;[2,20] found Strept pneumoniae to be the most common organism responsible for COPD.

Antibiogram revealed that, Piperacillin+ tazobactum and Aminoglycosides were the most effective antibiotic against all organism. Cephalosporins and Quinolones were less effective. Quinolones which were considered to be the first drug of choice, is no longer sensitive. This emergence of resistance could be due to their frequent usage. Mechanisms like selective pressure on organism due to uncontrolled use of quinolones, decreased permeability and active efflux of antimicrobial agent are involved for emergence of resistant strains.

Conclusion

COPD exacerbations and purulent sputum are the most important factors for the presence of bacterial infection which calls for the use of antibiotics. With continuously changing bacterial flora of COPD, choice of antibiotic should be based on the local bacterial resistance pattern. Periodic studies to identify probable agents and their antibiotic sensitivity pattern would assist in formulating a cost effective antibiotic strategy reducing the emergence of drug resistance.

References

1. Global Initiative for Chronic Obstructive Lung Disease – Global Initiative for Chronic Obstructive Lung Disease – GOLD [Internet]. Global Initiative for Chronic Obstructive Lung Disease – GOLD. 2017. Available from: http://goldcopd.org

2. P. Sharma et al., Sputum bacteriology and antibiotic sensitivity pattern in COPD exacerbation in India, Egypt. J. Chest Dis. Tuberc.66 (2017) 593-597
3. Vesna Cukic. The Most Common Detected Bacteria in Sputum of Patients with the Acute Exacerbation of COPD. Mater Sociomed. 2013 Dec; 25(4): 226-229.
4. Connors AF, Jr., Dawson NV, Th omas C, Harrell FE, Jr., Desbiens N, Fulkerson WJ, et al. Outcomes following acute exacerbation of severe chronic obstructive lung disease. Th e SUPPORT investigators (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments). Am J Respir Crit Care Med. 1996; 154(4 Pt 1): 959-967.
5. Wouters EF. Th e burden of COPD in Th e Netherlands: results from the Con-fronting COPD survey. Respir Med. 2003; 97 Suppl C: S51-9.
6. Donaldson GC, Seemungal TA, Bhowmik A, Wedzicha JA.Relationship between exacerbation frequency and lung function decline in chronic obstructive pulmo- nary disease. Th orax. 2002; 57(10): 847-852.
7. Kanner RE, Anthonisen NR, Connett JE. Lower respiratory illnesses promote FEV (1) decline in current smokers but notex-smokers with mild chronic obstructive pulmonary disease: results from the lung health study. Am J Respir Crit Care Med. 2001; 164(3): 358-364.
8. National Institute for Health and Care Excellence (NICE). Chronic Obstructive Pulmonary Disease in Over 16s: diagnosis and Management; 2010.
9. Sethi S, Murphy TF. Bacterial infection in chronic obstructive pulmonary disease in 2000: a state-of-the-art review. Clin Microbiol Rev 2001;14: 336–363.
10. Miravitlles M, Mayordomo C, Artes M, Sanchez- Agudo L, Nicolau F, Segu JL. Treatment of chronic obstructive pulmonary disease and its exacerbations in general practice. Respir Med 1999;93: 173-9.
11. Rennard SI, Farmer SG. Exacerbations and progression of disease in asthma and chronic obstructive pulmonary disease. Proc Am Thorac soc 2004;1:88-92.
12. Washington Winn Jr, Stephen Allen, William Janda, Elmer Koneman. Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources. In: Koneman's colour atlas and textbook of Microbiology, 6th edition. Lippincott, Williams and Wilkins publications, 2006: 68-111.
13. Barrow GI, Feltham RKA, ed. Cowan and Steel's manual for the identification of medical bacteria; 3rd edn. Cambridge: Cambridge University Press;1993.
14. Wilker MA, Cockerill FR, Craig WA. Performance standards for anti-microbial susceptibility testing: Clinical and laboratory standards institute. 15th informal supplement. 2005. M 100-SI5. 25(1) Wayne.PA.
15. White AJ, Gompertz S, Stockley RA. Chronic obstructive pulmonary disease. 6: Th e etiology of exacerbations of chronic obstructive pulmonary disease. Th orax. 2003; 58(1): 73-80.
16. Shahnawaz A, Saleem SM, Bhat MA, Bhat G, Dhobi GN (2003) Bacteriological profile in acute exacerbation of chronic obstructive pulmonary disease (COPD). JK Practitioner 10: 185-187.
17. H. Sharan, Aerobic bacteriological study of acute exacerbations of chronic obstructive pulmonary disease, J Clin Diagn Res 9 (8) (2015) DC10–DC12
18. K. Chawla, C. Mukhopadhay, M. Majumdar, I. Bairy, Bacteriological profile andtheir antibiogram from cases of acute exacerbations of chronic obstructive pulmonary disease: a hospital based study,

J Clin Diagn Res 2 (1) (2008 Feb)612–616.

19. S. Madhavi, M.V. Rao Rama, Janardhan R. Rao, Bacterial etiology of acute exacerbations of chronic obstructive pulmonary disease, J Microbiol Biotechnol Res 2 (3) (2012) 440–444
20. A. Patel, Sputum bacteriology and antibiotic sensitivity pattern of patients having acute exacerbation of COPD in India, J Pulm Respir Med 5 (1) (2015 Jan) 238.

.