



Research Article

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**A Clinical Study on Risk Factors and Appropriateness of Antibiotic Prescribing For Infective Exacerbation of Obstructive Airway Disease in Old Aged Patients**

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**ABSTRACT**

Medication Appropriate Index (MAI) is used to assess the quality of antibiotic prescribing. The aim of the study to determine the risk factors of obstructive airway disease and to assess the appropriateness of ongoing antibiotic therapy using medication appropriate index criteria. A 6 months study was carried out at Karuna Medical College Chittur. The patient details were collected in a specially designed data entry form and results were statistically analysed using chi square test. During the study period, a total of 202 patients were enrolled. Out of this, 150 (74%) were male patients and 52 (26%) were female patients and Distribution of risk factors, ex-smokers 34 (15%) were more prone to infective exacerbations, followed by smokers 34 (17%), alcoholics 33 (16%), allergies 12 (6%), ex-alcoholics 8 (4%) and patients with both smoking and alcoholism were 10 (5%). The most common problems were seen with indication (68%), duration of therapy (74%), and dose of antibiotic (81%), directions (68%), duplication (64%), effectiveness (75%) and expensiveness (68%). The level of significance was assessed and found to be significant. Males are more affected than females. The cigarette smoking influences the rate of influence of lung function by causing path physiologic changes in airways, including inflammation hyper responsiveness. Using medication appropriate index criteria when comparing inappropriate v/s marginal and inappropriate v/s appropriate both shows high level of significance which imply antibiotic therapy was inappropriate. It is found that inappropriate use of antibiotics will increase the burden of multi-drug resistance. Prescribing under generic name is considered economical and rational.

**Keywords:** Risk Factors, Appropriateness, Medication Appropriateness Index, Veterans.

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## INTRODUCTION

Obstructive airway disease (OAD) refers to a group of disease that cause airflow blockage and air breathing related problems, and it includes chronic obstructive pulmonary disease (COPD), bronchiectasis and asthma.

[1] A COPD exacerbation is characterized by an acute worsening of patient baseline symptoms including dyspnea, cough and or sputum, which may require alteration in regular medication. Exacerbation is a leading cause of hospitalization in patients with COPD that affects the quality of life and prognosis. Prevalence of infectious diseases in the elderly is increased due to factors like immunosenescence, altered skin and mucosal barrier function, degenerative changes in bone and cartilage and reduction in respiratory capacity. Patients with frequent COPD exacerbations have poorer quality of life and accelerated decline in lung functions. In old aged patients infective exacerbation of COPD is the major cause of death. [2] These results from several factors such as cigarette smoking, exposure to occupational dusts, fumes, environmental pollution and bacterial infection. It is more common during winter months, especially during influenza outbreaks. Tobacco smoke and other air pollutants appear to worsen symptoms and may prolong the cough. Inhaled allergens,  $\beta$  adrenergic drugs, exercises, air pollution, cold air, occupational exposures and stress can trigger asthmatic symptoms. [3]

The use of antibiotics has become a routine practice for the infective exacerbations. [4] Early administration of appropriate antimicrobials has been postulated as a key strategy in the survival of patients with very severe infections. Antibiotics can be lifesaving drugs, but also carry significant potential harms. Numerous challenges associated with antibiotic use exist in the elderly. About 50-80% of Geriatrics receives an antibiotic every year and 25-75% of antimicrobials prescribed in nursing homes are considered inappropriate. Rapid, indiscriminate administration of broad-spectrum antibiotic therapy also favours antibiotic resistance. There are significant risks and possible adverse consequences of inappropriate antibiotic therapy in the elderly.

The selection and use of appropriate antibiotics will determine the success of treatment and can avoid the occurrence of antibiotics resistance. [5] Inappropriate prescribing is a common problem, especially among elderly patients, although the reported prevalence of the problem is variable due to the lack of a GOLD standard. [4] While appropriate selection is essential, inappropriate prescribing in terms of dosage, duration of therapy, drug-drug interactions, and drug-disease interactions is also important because it can contribute to increased adverse drug reactions, health care costs, and bacterial resistance. [6] The threat caused by injudicious use of antibiotics can be optimized by implementing appropriate use of antibiotics. [7-27]

The Medication Appropriateness Index (MAI) developed by Hanlon *et al.*, in 1992 and modified in 1997 is intended to be a reliable, standardized method of addressing multiple elements of drug therapy prescribing, applicable to a variety of medications and clinical conditions. [1] Medication Appropriate Index (MAI) is used to assess the quality of antibiotic prescribing. The MAI measures ten domains of prescribing they are indication, effectiveness, dosage, directions, practicality, drug-drug interactions, duplication, duration, expensiveness, route of administration [1] Indication is defined as sign, symptom, disease, or condition for which medication is prescribed. Appropriate indication determines proper drug selection which is based on accurate diagnosis. [1] Effectiveness is defined as producing a beneficial result. It assess whether the drug prescribed is capable of being effective for the indication in a population of patients. Selection of appropriate antibiotics can leads to the success of therapy. [1] Dosage is defined as the total amount of medication taken per 24 hour period for regularly scheduled medications. It is an important factor in successful treatment of infection. Excessive dose may cause toxicity and side effects. So dose calculation should be based on circumstances and patient's condition. [1] Directions are defined as the instructions in the use of a medication by a patient. It assesses the route of administration, relationship to food and liquid, the schedule, and time of the day. So taking the drugs correctly and understanding the right way for administering them can reduce the risk. [1] Direction practical is defined as capable of being used or being put into practice. It assess whether the directions for use are practical for the patient to take and takes into consideration the potential for patient adherence without sacrificing efficacy, as well as formulary. [1] Drug-Drug interactions are an interaction is said to occur when the effects of one drug are changed by the presence of another drug. Sometimes drug interaction may result in reduction in efficacy of prescribed antibiotics. Clinical significance can note a harmful interaction. [1] Unnecessary duplication is defined as non-beneficial or risky copying of drugs. Unnecessary duplication exists when two drugs from the same chemical or pharmacological class are prescribed simultaneously. Duplicate prescribing is known to occur across health systems and is one of the most frequent drug related problems. Therapeutic duplication increases the risk of adverse drug reactions without additional therapeutic benefits. [1] Duration is defined as length of therapy. It estimates whether the length of time that the patient has received the drug is acceptable. According to standard guidelines, duration of antibiotic treatment in respiratory tract infections is 5-10 days. Inappropriate duration of antibiotic treatment leads to development of antibiotic resistance. [1] Cost of therapy, is assess how the cost of the drug compares to other agents of equal efficacy and safety.

Cost effectiveness of antibiotics influenced by several factors relating to characteristics and use of antibiotics (i.e., diagnosis, resistance, patient compliance with treatment and treatment failure). So physicians need to take into account of these factors when prescribing on antibiotics and assess whether a specific antibiotic treatment adds sufficient value to justify its cost. [1] Route of administration, In majority of the cases parenteral administration of antibiotics are more common than oral and in some cases parenteral drug was switched to oral form. Factors such as the unavailability of an oral preparation and a patient's inability to tolerate one may influence the choice of this route. [1]

Considering the above stated circumstances we have carried out this study with the objectives of evaluating the risk factors of obstructive airway disease and to assess the appropriateness of antibiotic prescribing in infective exacerbations among elderly patients.

**MATERIALS AND METHODS**

**Study Site**

The study was carried out in the General Medicine Department of Karuna Medical College Hospital, Palakkad District, Kerala, India.

**Study Design & Study Duration**

The study was designed as a 6 months Prospective observational study (November 2016 to April 2017) and 3 month Retrospective observational study (August 2016 to October 2016).

**Study Population**

A total of 202 subjects included in the study. The patients were selected on the basis of inclusion and exclusion criteria.

**Study criteria**

**Inclusion criteria**

Patients greater than 60 year old, patient visiting outpatient and inpatient Department of General medicine with obstructive airway disease and patients willing to participate.

**Exclusion criteria**

Patients with tuberculosis and on treatment with immunosuppressants and patients unwilling to participate.

**Study Procedure**

The study was approved by Institutional Ethical Committee (GCP/IEC/1173/2016) dated on 24.10.2016. A predesigned data collection form was used to collect the prescription details of inpatients and outpatients of Department of General Medicine. Data collection form which includes the patient demographic profiles, past medical and medication history, treatment chart and pharmacist intervention. Medication Appropriate Index (MAI) is used to assess the quality of antibiotic prescribing. The MAI measures ten domains of prescribing (i.e., indication, effectiveness, dosage, directions, practicality, drug-drug interactions, duplication, duration, expensiveness, route of administration) [Annexure 11.1]

**Statistical Analysis**

Graph pad prism 7 Software (Chi-square test).

**RESULTS**

During the entire study period we evaluated 202 prescriptions with obstructive airway diseases and assessed the appropriateness using MAI criteria. Figure 1 show that study distribution. Among 202 cases, retrospective study was carried out with 101 patients (50%) and prospective study was carried out with 101 patients (50%).

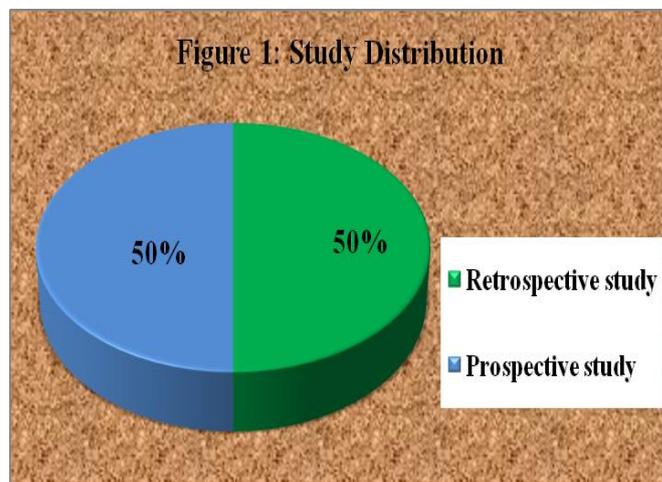


Fig. 1: study distribution

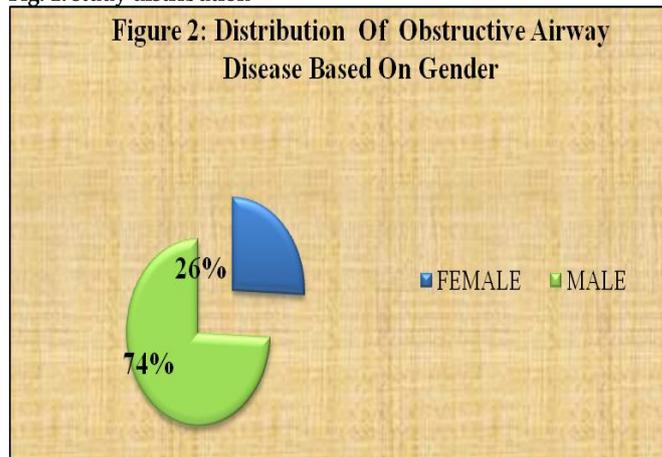


Fig. 2: Gender distribution among the study population

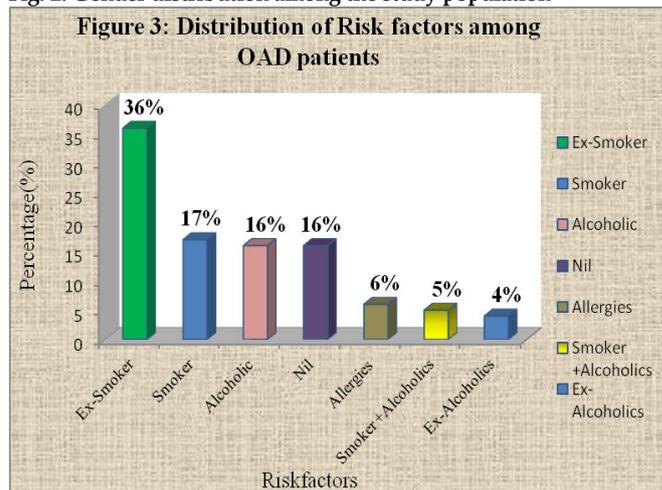


Fig. 3 : Distribution of risk factors among study population

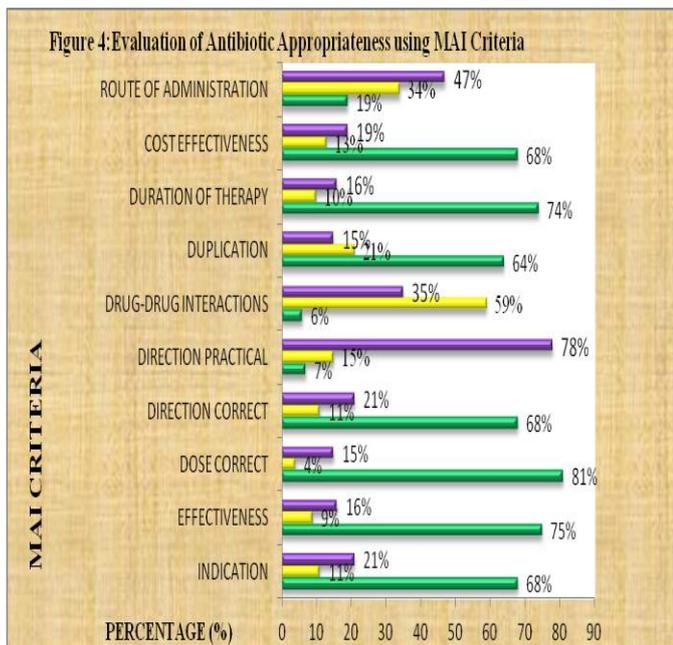


Fig. 4: evaluation of antibiotic appropriateness using MAI criteria

Table 1: Level of Antibiotic Appropriateness

S. No	Level of Appropriateness	P value
1	Inappropriate v/s Marginal	<0.0001****
2	Inappropriate v/s Appropriate	<0.0001****

Figure 2 show that distribution of obstructive airway disease based on gender. During the study period, a total of 202 patients were enrolled. Out of this, 150 (74%) were male patients and 52 (26%) were female patients. The study revealed that higher incidence of obstructive airway diseases for male patients when compared to female patients. Figure 3 show the distribution of risk factors among patients with obstructive airway disease. In this study, ex-smokers 34 (15%) were more prone to infective exacerbations, followed by smokers 34 (17%), alcoholics 33 (16%), allergies 12 (6%), ex-alcoholics 8 (4%) and patients with both smoking and alcoholism were 10 (5%). Figure 4 show evaluation of antibiotic appropriateness using MAI criteria. Of the 202 patients, 174 (86%) had a problem with antibiotic prescribing according to the MAI criteria. The most common problems were seen with indication (68%), duration of therapy (74%), and dose of antibiotic (81%), directions (68%), duplication (64%), effectiveness (75%) and expensiveness (68%). We evaluated the multiple dimensions of antibiotic prescribing for obstructive airway disease. Table 1 shows the level of antibiotic appropriateness. Appropriateness was analyzed using three parameters such as marginal, appropriate and inappropriateness

## DISCUSSION

The goal of the study was to evaluate the appropriateness of antibiotic prescribing in old aged patients with obstructive airway disease. The administration of appropriate antibiotics has been postulated as a key strategy in the survival of patients with very infections. Especially in old aged patients the

antibiotic selection should be appropriate in accordance with standard treatment.

Lifestyle of the male population would have contributed in this disparity. Females also have a chance to get COPD. This suggests that contribution of environmental exposure other than active smoking leading to COPD seems to more substantial in females. [6] The study done by Kancherla *et al* [7] also found that male patients were comparatively more than the number of female patients. Errabelly P *et al* [24] also reported a male predominance in the study.

The cigarette smoking influences the rate of influence of lung function by causing pathophysiologic changes in airways, including inflammation hyper responsiveness. [3] Previous study done by N Terzikhan *et al* [6] also found that ex-smokers were more compared to current smokers in obstructive airway disease.

We found that more than two-thirds of patients had one or more prescribing problems with antibiotics. This rate is higher than rates ranging from 15-55% found in previous studies. [4] Of the factors we evaluated the history of alcohol abuse was independently associated with inappropriate prescribing. One possible explanation is that practioners take extra time to think about proper dosing in patients with alcohol abuse since they are immunosuppressed. But the study conducted by Tobia *et al* [1] evaluated the antimicrobial appropriateness in hospitalized patients and found that 65% had a problem with antibiotic prescribing and most common problems were seen with expensiveness, practicality and dosage of the antibiotic. Improving the appropriate use of antibiotics is a difficult task, but necessary in order to decrease the development of antibiotic resistant bacteria. [4] When comparing inappropriate v/s marginal and inappropriate v/s appropriate both shows high level of significance which imply antibiotic therapy was inappropriate.

Our study evaluated that there is a high rate of inappropriate antibiotic prescribing that extends beyond antibiotic selection for old aged patients diagnosed with OAD (COPD, bronchitis, bronchiectasis and asthma). Improper directions, incorrect dosing, ineffectiveness, unnecessary duplication, incorrect duration of therapy and choosing more expensive medication were the common reasons for inappropriate prescribing. It is found that inappropriate use of antibiotics will increase the burden of multi-drug resistance. Prescribing under generic name is considered economical and rational. This study gives us an insight to the current status of antibiotic prescribing and is also recommending to maintain well accepted standard treatment guidelines.

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**REFERENCES**

1. Tobia CC, Aspinaa LS, Good BC, Fine JM, Hanlon TJ. Appropriateness of antibiotic prescribing for veterans with community-acquired pneumonia, sinusitis, or acute exacerbations of chronic bronchitis. *Clinical Therapeutics*. 2016; 30(6):1135-1144.
2. Tyrstrup M, Beckman A, Mol SS, Engstrom S, Lannering C, Melander E, Hedin K. Reduction in antibiotic prescribing for respiratory tract infections in Swedish primary care - A Retrospective study of electronic patient records. *BMC Infectious Diseases*. 2016; 16:709.
3. Barbara G. Wells, Joseph T Dipiro, Terry L Schwinghammer, Cecily V Dipiro. *Pharmacotherapy Handbook*. 6<sup>th</sup> Edition. MC Graw-Hills, New York, 2006, pp. 419-440.
4. Leilanj J. Rational use of antibiotics in respiratory tract infections. *South African Pharmaceutical Journal*. 2012; 79(4):34-38.
5. Ahamad A, Khan UM, Malik S, Mohanta GP, Parimalakrishnan S, Patet I, Dhingra S. Prescription patterns and appropriateness of antibiotics in the management of cough /cold and diarrhea in a rural tertiary care teaching hospital. *J Pharm Bioallied Sci*. 2016 Oct-Dec; 8(4): 335-340.
6. Charles Brayan MD. *Infectious Disease. Microbiology and Immunology*. Online University Of South Carolina School Of Medicine: 1-9.
7. Kancherla D, Sai Satya MV, Devi G, Devi G, Sharma S. A Study on prescribing pattern of antibiotics in respiratory tract infections in a tertiary care centre. *IJRSR*. 2015; Jun 28; 6(6):4558-63.
8. Lakshmi R, Chandran Lavanya R, Baby C, Swathikrishna K. A Study on antibiotic prescribing pattern in obstructive lung disease inpatients. *Asian journal of Pharmaceutical and Clinical Research*. 2015 Nov 28; 9(1):260-62.
9. Adeloje D, Chua S, Lee C, Basquill C, Papan A, Theodoratou E, Nair H, *et al.* Global and regional estimates of COPD Prevalence: Systematic Review and Meta-Analysis. *J Glob Health*. 2015 Dec; 5(2):020415.
10. Pandey K, Khan AI. Drug prescribing patterns in patients visiting the emergency medicine department at a tertiary care teaching hospital: A Prospective Study. *International Journal of Basic Clinical Pharmacology*. 2016; 5:163-8.
11. Brian R Walker, Nicki R Colledge, Stuart H Ralston, Ian D Penman. *Davidson's principle and practice of medicine*. 22<sup>nd</sup> Edition. Churchill Livingstone, London, 2014, pp. 303-357
12. Roger Walker, Cate Whittlesea. *Clinical Pharmacy and Therapeutics*. 5<sup>th</sup> Edition. Churchill Livingstone, London, 2012, pp. 545-555
13. KD Tripathi. *Essentials of Medical Pharmacology*. 7<sup>th</sup> Edition. Jay Pee, New Delhi, 2013, pp. 688.
14. Bregnhøj L, Thirstrup S, Kristensen BM, Sonne J. Reliability of a modified medication appropriateness index in primary care. *Eur J Clin Pharmacol*. 2005 Nov; 61(10):769-773.
15. Kayode M, Micheal A. A Study of rational prescriptions of penicillin and cephalosporin antibiotics in a secondary health care facility in south west Nigeria. *Global Journal of Medical Research*. May 2012; 12(4):312-315.
16. Rabe FK, Hurd Suzanne, Anzueto Antonio, Barnes JP, Buist AS. Global Strategy for diagnosis, management and prevention of COPD. *American Journal of Respiratory and Critical Care Medicine*. 2007; 6: 532-555.
17. Bishara J, Hershkovitz D, Paul M, Rotenberg Z, Pitlik S. Appropriateness of antibiotic therapy on weekends versus weekdays. *J Antimicrob Chemother*. 2007 Sep;60(3):625-628.
18. Goudanavar P, Panavila L, Ninan N, Pratima KC. Drug use evaluation of third generation cephalosporins in a tertiary care teaching hospital. *International Journal of Therapeutic Applications*. 2016; 32:81-85
19. Ullah A, Kamal Z, Ullah G, Hussain H. To determine the rational use of antibiotics; A Case study conducted at medical unit of Hayatabad medical complex. *IJRANSS*. July 2013; 1(2):61-68.
20. Adorka M, Mitonga KH, Lubbe M, Serfontien J, Allan K. Assessment of the appropriateness of antibiotic prescriptions in lesotho public hospitals: A Novel methodology based on principles of antibiotic prescribing. *Journal of Public Health in Africa*. 2014; 5:354.
21. Tunger O, Karakaya Y, Cetin BC, Dinc G, Borand H. Rational antibiotic use. *Journal of Infections in developing countries* 2009; 3(2):88-93.
22. Vergidis P, Hamer HD, Meydani NS, Dallal EG, Barlan FT. Patterns of antimicrobial use for Respiratory tract infections among older residents of long-term care facilities. *Journal of the American Geriatrics Society*. 2011; 59(6):1093-1098.
23. Harris AM, Hicks AL, Qaseem A. Appropriate antibiotic use for acute respiratory tract infection in adults: Advice for high-value care from the American College of Physicians and the Centers for disease control and prevention. *Annals of Internal Medicine*. 2015; 162(6):1849-1860.
24. Errabelly P, Ramavath Vineela, Afreen Arshiya, Sanaboina Alekya. Analysis of the prescribing patterns of antibiotics in respiratory tract infections at Department Of Medicine at a tertiary care hospital. *IJPSR*. 2015 Jul 01; 6(7):2963-67.
25. Sunil S, Gigi Arya, Hepzhiba P, Dr. Mahesh NM, Giri M, Dr. Ajoy Krishna Murthy. Drug utilization evaluation in chronic obstructive pulmonary disease patients- A Prospective Study. *WJPPS*. 2015 Oct 29; 5(1):1133-44.
26. Adil SM, Khan AM, Khan NM, Sultan I, Khan AM, Ali A, Farooqui A. EMPADE Study: Evaluation of medical prescriptions and adverse drug events in COPD patients admitted to intensive care unit. *J Clin Diagn Res*. 2015 Nov; 9(11): FC05-FC08.
27. Gowan MC, Benett B, Bare M. An Analysis of the utilization and expenditure of medicines dispensed for the management of severe asthma. *Irish Medical Journal*. 2009; 102 (3):73-6.

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