

## COST OF ACUTE EXACERBATION OF COPD IN PATIENTS ATTENDING GOVERNMENT HOSPITAL IN KERALA, INDIA

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### ABSTRACT

Although exacerbations are the major cause of hospitalizations and financial burden in patients with COPD, little information is available on the costs of their management in different settings.

The study objective was to provide an estimate of cost of acute exacerbation of COPD in patients attending tertiary level government hospitals in South India. This study is a prospective observational study aimed at identifying different costs in the treatment of acute exacerbation of COPD for seven days under non-experimental conditions using a total number of 120 eligible consenting patients. Cost data were based on existing information on cost of the hospital and Government rates for drugs and investigations. The mean total cost calculated for COPD exacerbation for 7day stay was found out to be \$ 89.75 (INR 4128. 36/-). The distribution of the total costs in the present study was 93% direct costs, and 7% indirect costs. Direct medical costs contribute 80% of the total cost. Although the drug cost contribution in total cost was only 9.1%. The total treatment cost was highly correlated with the disease severity ( $p < 0.01$ ). Costs of management of acute exacerbation of COPD are exceptionally low in government hospitals in India compared to data obtained from developed countries.

**Keywords:** COPD, Exacerbation, Cost, Government, Kerala, India.

### INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide, and consequences in an economic and social burden that is both extensive and increasing especially in developing countries. In India it is accounted for 2.8% of total deaths in 1990 and it is expected to rise to 6.5% deaths by 2020.<sup>9</sup> Since acute exacerbations are the main cause of hospitalization among COPD patients, it can be concluded that the economic burden of acute exacerbations is significant. But little information is available on the costs of their management.<sup>1,2</sup>

Goals of management in COPD include reduction of airflow limitation, preventing and treating secondary medical complications, lessening respiratory symptoms and improving health related quality of life. A fourth reasonable goal in a cost-conscious environment is to use health-care resources efficiently given the enormous economic impact of the condition. To facilitate this goal, economic information regarding the treatment should be made available for incorporation into treatment guidelines.<sup>1,3</sup>

Information on cost of acute exacerbation of COPD is available mostly from western countries. We could not locate a clinical based study on cost assessment on acute exacerbation of COPD from government hospitals in India. This study aimed to estimate the total cost of acute exacerbation of COPD in patients attending government hospital in India.<sup>2,4-7</sup>

### METHODS

The study was done at the Department of Tuberculosis and Respiratory Disease, Government Medical College, Thiruvananthapuram, Kerala, India. This study is a prospective observational study aimed at identifying different costs in the treatment of acute exacerbation of COPD for seven days under non-experimental conditions. The treatment of the exacerbation is left to the criteria of the attending physician. All information significant to the study is collected from the case record and interviews with the inpatients and bystanders during ward rounds with the assist of a physician. Also, daily follow up is conducted to gather data on amendment in therapy, add-on therapy, and clinical improvement until the patient is discharged from the hospital or to a maximum of seven days, whichever is earlier.<sup>12,13</sup> The study was conducted in January 2008 to April 2008. The study was approved by the Human Ethical Committee of Government Medical College, Thiruvananthapuram, India in 2007. An informed consent form, approved by the Human Ethical Committee, was signed by all

patients and this process was in accordance with Good Clinical Practice.

### Study sample

A total number of 120 eligible consenting patients were randomly chosen for the study. Patients with diagnosis of acute exacerbation of COPD and carry on treatment as defined by Global Initiative for Chronic Obstructive Lung Disease, 2006 were eligible for inclusion.<sup>1</sup> Exclusion Criteria were as follows: diagnosis of cystic fibrosis, asthma, or severe bronchiectasis, evidence of pneumonia and poor adherence<sup>8</sup> to the treatment either at presentation or during follow-up.

### Cost analysis

The total costs includes direct costs both medical costs and non-medical costs and indirect costs (Table1).<sup>15,16</sup> Expenditures for this study are calculated in US dollar (exchange rate at the time of the study, 46 Indian rupees per dollar). The direct medical costs comprise the cost of the drugs, lab investigations, oxygen therapy, and the costs of the treatment per bed per day. The unit cost for the inpatient treatment of a patient per bed per day is calculated as \$ 6.52 on the basis of budget allocation-2006 of the institution. The cost of the drugs is calculated as per the Central Purchase Committee list of the Government of Kerala. The cost of the drugs not included in the official list is calculated based on the average wholesale price given in the monthly index of medical specialties. The unit cost of oxygen therapy is calculated as \$ 0.8 per day. The lab investigation costs are as per the costs in the manual of ACRL of the institution. The indirect costs due to lost of work days, lost productivity, travel time and waiting time are calculated by interviewing both the patients and their bystanders.

### Statistical Analysis

Data were analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 10. Data are expressed in its frequency and percentage. To elucidate the associations and comparison between different parameters, Chi square (x<sup>2</sup>) test, t test, paired t test, were used.

### RESULT

A total of 120 patients were initially identified and included in the analysis. Demographic and clinical characteristics of the study patients at the time of identification are summarized (Table 2). Majority of the patients were of a low socioeconomic status

according to the modified Kuppaswamy scale.<sup>10</sup> Most of the patients came under type I and type II grade of exacerbation (52.5% and

37.5% respectively) as per the Anthonisen and Colleagues grading scale for exacerbation of COPD.<sup>11</sup>

**Table 1: Health-Care Resource Cost Estimates Used in our Study\***

Parameters	Cost
Medications	2008 official list of CPC Government of Kerala, India. Cost of the drugs not included in CPC taken from AWP given in MIMS, January-April 2008.
Oxygen therapy for 24 hrs	\$0.80- (As per Govt. price list, oxygen/kg = \$ 0.27)
Lab tests	2008 Manual of ACRL, Trivandrum, Govt. Medical College
Unit cost for the inpatient treatment of a patient per day (Include procedures and emergency department visit)	Based on Budget allocation of the institution in 2007 $Treatment\ cost\ per\ patient\ per\ bed = Total\ expense\ calculated\ per\ year / 365 \times 1 / No.\ of\ inpatients\ per\ day$ (Mean) = \$ 945435 / 365 X 1/400 = Approximately \$ 6.52

\*CPC: Central purchase committee of the Government; ACRL: Advanced Clinical Research Laboratory (as per WHO guidelines); AWP: Average wholesale price

**Table 2: Characteristics of the Study Population (n=120)**

Variables	Mean (SD) or %.
Male sex	87.5
Age, yr	66 (11)
Socio economic status	
Upper middle	7.5
Lowe middle	42.5
Upper lower	50
Active smokers	42.5
Smoking Index > 300	94.4
Co morbid conditions	
Hypertension	30
Diabetes	30
Alcoholism	55.8
CAD	10
TB	10
Renal disease	5
Hyperlipidemia	2.5
Spirometry taken	75
Post-treatment -	44.1 (6.2)
FEV1, % of predicted	38.9
FEV1 < 40%	61.1
FEV1 >40%	
Grade of exacerbation <sup>11</sup>	
Grade I	52.5
Grade II	37.5
Grade III	10

The mean total cost calculated for COPD exacerbation for 7day stay was found to be \$ 89.75 (INR 4128. 36/-). The distribution of the total costs in the present study was 93% direct costs, which comprise both medical and non medical costs and 7% indirect costs due to lost of work days, lost productivity, travel time and waiting time.

Direct medical costs consist of cost for drugs, medical devices, physician visits, emergency room visits, diagnostic testing services, education and research, which contribute 80% of the total cost. Although the drug cost contribution in total cost was only 9.1%. Direct non-health care costs include home care services, transportation, special nutrition, accommodation contribute about 13% of the total cost. The mean drug cost, oxygen cost, direct cost, and indirect cost were \$ 8.15, \$ 2.27, \$ 83.45, and \$ 6.26 respectively. The total treatment cost was highly correlated with the disease severity ( $p < 0.01$ ). Highest cost is for type I exacerbation followed by type II and type III.

## DISCUSSION

The knowledge about the cost of different diseases is helpful in planning and achieving relevant health policies. COPD is a disease with highly skewed costs, and to get the full picture of it, it is important to study the costs for patients with varying severity of the disease especially during the exacerbation.<sup>5</sup> Exacerbation of COPD is the main cause of hospitalization and which represents the major part of the total direct costs generated by patients with COPD.<sup>2</sup>

However, few studies have been aimed at quantifying the burden of the disease. Most of these studies are estimated based on administrative and population data and use a prevalence based cost illness approach. Others used data from health care databases.<sup>2, 4-7, 14</sup> But this study is a follow up study of inpatients admitted with acute exacerbation of COPD aimed at quantifying prospectively the total costs which include both the direct and indirect costs incurred by the patients during an average stay of 7 days.

Demographic profile of patients in this study reveals that most of them were of low socioeconomic status according to the modified Kuppaswamy scale.<sup>10</sup> This may be because the hospital in which the study was undertaken is a Government hospital offering free treatment. Another explanation may be that people of low socioeconomic status tend to have increased incidence of COPD.<sup>1, 17</sup>

The mean total cost calculated for the inpatient treatment of COPD exacerbation for 7day stay of \$ 89.74 is lower than that reported by Marc Miravittles et al in the treatment cost for COPD in Spain.<sup>2</sup> The costs of \$ 978 by Miravittles et al study is about 10 times higher than the present study but were probably lower than most countries in Europe or the United States.<sup>2</sup> This is another testimonial that treatment costs in India is much less compared to most other developed countries.

The division of the total costs in the present study was 93% direct and indirect cost a meager 7%. This was not in concordance with the previous studies conducted by Daniel E. Hilleman et al and Sven-

Arne Jansson et al which revealed that 58% and 38% respectively.<sup>4,5</sup> This may be because majority of the patients in this study were above 50 years. Most of them were unemployed and the option of disability pension is unavailable in India. Also most of the patients were of low socioeconomic status and working as unskilled laborers, on an average of 3-4 days per week. So this period of morbidity has not probably affected their productivity as compared to their counterparts in Western countries employed in skilled work.

KJR Murthy and J.G. Sastry,<sup>7</sup> projected hospitalization cost in 2006 in India was \$ 174.30 for an average patient admitted with COPD exacerbation based on treatment guideline. But in the present study the average mean cost in 2008 was \$ 89.74 only. This disparity may have been due to the fact that the cost calculated was for only 7 days. According to the discharge criteria for the exacerbated patients set forth by the GOLD committee,<sup>1</sup> the duration of the treatment was very likely to be much longer than 7 days for the majority of the studied patients.<sup>19</sup> As the per FEV1 value is the discharge standards in this study only around 61% could be considered for discharge.<sup>18</sup> So the costs to be calculated are likely to be for more than 7 days. Another reason for the calculated cost being low was due to this study being conducted in a Government hospital. There is huge reduction in the cost of drugs and investigations as compared to the private hospitals. Also the cost of oxygen which contributed to the highest proportion in the direct medical costs is only \$ 0.80 per day in this institution as compared to approximately \$ 13.04 per day in other surrounding private hospitals. Another remarkable finding of this study that the total treatment cost was highly correlated with the disease severity which is similar to study by Daniel E. Hilleman et al.<sup>4</sup> Highest cost is for type I exacerbation followed by type II and type III.

According to the inpatient data available in the present hospital there were on an average 55 COPD patients per month or about 660 patients per year. The mean total cost calculated for COPD exacerbation for 7day stay was found out to be \$ 89.75. Extrapolating this to the total 660 patients, the economic burden for 7day stay of patients admitted with COPD exacerbation in this institution alone comes to around \$ 65217 (30 lacks INR) per year.

The findings in this study are not representative of the cost burden suffered by the patient undergoing treatment in other hospitals. A simple example is the cost of drugs and oxygen. This study calculated costs for drugs and oxygen for 7 days duration to be \$ 10.41 while a similar treatment in a private hospital would cost \$ 55.52.

Although this study provides a preliminary estimate of the cost involved, the selected population was not truly representative of the community. Most of the candidates were of low socioeconomic groups only is not an exact representative of the cost burden suffered by the patient undergoing treatment in other hospitals.

In summary, costs of management of acute exacerbation of COPD are low in government hospitals in India as compared to data obtained from developed countries. By taking into consideration the predicted increase in mortality and morbidity due to COPD the cost of treatment will pose a major economic burden in a population country like India. The formulation of a strategy to tackle these impending crises is of prime importance.

**Abbreviations:** COPD= Chronic obstructive pulmonary disease, CPC= Central purchase committee list, ACRL= Advanced clinical research laboratory, US \$= United States Dollar, INR= Indian National Rupees, Govt. = Government.

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