

Economic impact of chronic obstructive pulmonary disease: A cross-sectional study at teaching hospital in South India

Theophilus Lakiang¹, N. Sreekumaran Nair¹, Aarthi Ramaswamy¹, Umang Singhal¹

¹Department of Public Health, Public Health Evidence South Asia, Manipal University, Manipal, Karnataka, India

ABSTRACT

Background: Chronic obstructive pulmonary disease continues to be the important contribution toward disability, death, and burden in the costs of health care globally. Economic impact of COPD is attributed with substantial direct and indirect costs. COPD affects the productivity of work that poses a burden on the employers and also on individuals in terms of loss of pay, limitation of activities, and related disability. **Materials and Methods:** Hospital-based cross-sectional study among 24 respondents in selected hospital in Udupi Taluk. Respondents were identified by purposive sampling technique and data were collected in respondent's mother tongue. An interviewer administered questionnaire was used to collect data related to patient's demographic status, disease history, and direct and indirect costs of COPD. Data were analyzed using SPSS software version 15. **Results:** The mean total direct medical cost that was observed among 24 respondents was Rs. 29,885 ± 11,995.33 and the mean total direct nonmedical cost was Rs. 7,441.25 ± 2,228.90. The mean total direct medical costs of COPD patients with comorbidity were Rs. 28,148.2353 ± 2,578.01580 and for those without comorbid illness was Rs. 13,460.0000 ± 1,255.33528. The observed mean absenteeism in the past 28 days was 193.50 ± 33.62 h. The mean absolute presenteeism of respondents is 72.05 ± 7.55. **Conclusions:** The major drivers of the total cost were cost of hospitalizations and medication costs. Acknowledging the costs and economic impact of COPD is therefore extremely important in the management of COPD and in reducing the mortality and morbidity related to COPD and in improving adherence to treatment.

Keywords: Chronic obstructive pulmonary disease, cross-sectional study, economic impact

Introduction

The health, economic, and social consequences related to COPD are both substantial and increasing.^[1] World Health Organisation estimated that 65 million people live with moderate to severe COPD and more than 3 million died because of COPD on 2005.^[2] COPD economic consequences are evident but the impact of various factors on the overall cost of COPD management remains to be obsolete.^[3] Health expenses of COPD is significantly higher and about 83% and 17% of the

direct medical costs are attributed to exacerbation and chronic medication, respectively. Working adults with COPD reported a significantly lower quality of life and productivity at work place.^[4] Comorbidities of COPD contribute significantly to costs and mortality and increased costs were associated with large and urban hospitals.^[5] COPD patients who paid more out of pocket expenditures experiences economic hardship.^[6] There is a lack of published evidenced related to the economic impact of COPD in the South Indian Context. Hence, the objective of this research is to study the economic impact (direct and indirect costs) of diagnosed COPD patients undergoing treatment in selected tertiary care hospital in South India.

Address for correspondence: Dr. N. Sreekumaran Nair, 6th Floor Library Building, Manipal University, Manipal, Karnataka, India.

E-mail: sree.nair@manipal.edu

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_75_16

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Lakiang T, Nair NS, Ramaswamy A, Singhal U. Economic impact of chronic obstructive pulmonary disease: A cross-sectional study at teaching hospital in South India. J Family Med Prim Care 2018;7:1002-6.

Materials and Methods

A hospital-based study was carried out from December 2014 till June 2015 in selected teaching hospital in South India. The total sample size generated after the pilot study was 39 but only 24 samples were identified as it was not feasible to collect enough data related to indirect costs as most of the respondents were retired. The inclusion criteria for participant's selection were COPD patients who were currently under treatment and those who are still undergoing treatment at least from the past 12 months and a purposive sampling techniques was used to identify the same, patients who were stable during the time of data collection and who were not on nebulizers or oxygenation therapy or any other medical procedures at the time of data collection were selected. Patients who were not willing to participate were excluded from the study. An ethical clearance was obtained from the concerned Institutional Ethical Committee Board. A written informed consent was taken from all the participants prior to data collection. Data collection was kept anonymous and data obtained were kept confidential.

Development of tools and data analysis

A semi-structured questionnaire was used for collecting data. The questionnaire consisted of four sections: first section consisted of questions related to sociodemographic characteristics of the participants, the second section consisted of questions related to disease history, the third section consisted of questions related to direct medical and direct nonmedical costs, and the fourth section consisted of questions related to indirect costs in terms of absenteeism and presenteeism. Questionnaire related to sociodemographic variables, disease history, and direct medical and direct nonmedical costs were developed based on literature reviews and were pretested and piloted and WHO-absenteeism and presenteeism questionnaire was used for indirect costs. To ensure reliability and validity of the questionnaires a pilot study was conducted among 10 COPD patients that met the inclusion criteria of the study. Necessary modifications of few questions were made after the pilot study. The data collected was then taken for economic and statistical analysis. For economic analysis, a human capital method was used for estimating direct costs. The direct costs were estimated by multiplying the unit cost to the frequency of utilization. Absenteeism and presenteeism were estimated by relative and absolute absenteeism and presenteeism as well as relative hours of work given by WHO's in their Health and Work Performance Questionnaire (HPQ).^{17]} For statistical analysis, SPSS version 15 was used; descriptive analysis of sociodemographic variables and direct costs was done, Pearson correlation coefficient was computed to determine the correlation between duration of illness and direct medical costs.

Results

Sociodemographic status

A total of 24 participants were included in the study from two tertiary care hospitals. Table 1 illustrates the distribution of frequency and percentage of the respondents according to their sociodemographic characteristics. Of the total 24 participants

the maximum number of participants falls within the age group of 50 years and above. All of the respondents were married and about 58.3% of the participants were self-employed.

Disease history

Figure 1 illustrates the comorbidity, hospitalization history, and medication history of the participants. About 70.8% (17) of the respondents were suffering from other diseases (besides COPD) as well. About 54.2% (13) of the respondents had been hospitalized before due to COPD. In the past 12 months about 95.8% (1) of the respondents were under treatment for their current illness. The observed mean duration of illness of the respondents was 3.5 ± 2.5 years.

Direct medical costs [Table 2]

Pretested structured questionnaire were used to gather data on direct medical costs that include costs of OPD visits, medication

Table 1: Socio-demographic status

| Characteristics | Category | Respondents | |
|--------------------------------|------------------------------------|---------------|----------------|
| | | Number (n=24) | Percentage (%) |
| AGE (in years) | 41-50 | 7 | 29.2 |
| | 50 or older | 17 | 70.8 |
| Marital status | Married | 24 | 100 |
| Employment status | Full-time job | 9 | 37.5 |
| | Part-time job | 1 | 4.2 |
| Family member | Self-employed | 14 | 58.3 |
| | 5 or under | 11 | 45.8 |
| | 4-7 | 10 | 41.7 |
| Health Insurance | 8-10 | 3 | 12.5 |
| | No | 24 | 100 |
| Monthly household income (INR) | Yes | 0 | 0 |
| | Rs. 5571 and above | 9 | 37.5 |
| | Rs. 2786-5570 | 5 | 20.8 |
| | Rs. 1671-2785 | 2 | 8.3 |
| | Rs. 836-1670 | 1 | 4.2 |
| Educational Status | ≤Rs. 836 | 7 | 29.2 |
| | 10 th standard or under | 17 | 70.8 |
| | 12 th standard | 1 | 4.2 |
| | I didn't go to School | 6 | 25 |

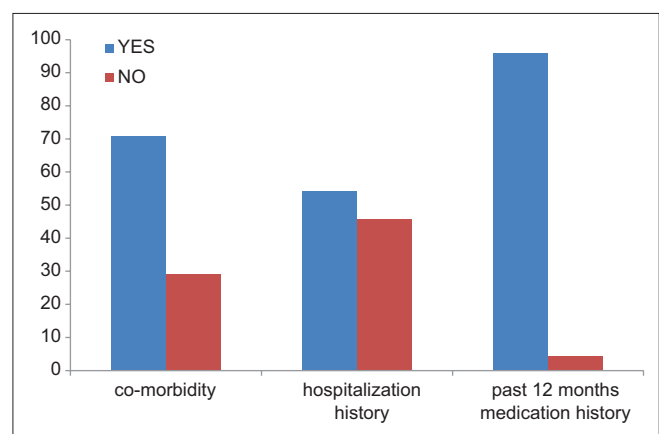


Figure 1: Distribution of co-morbidity, hospitalization history, and medication history

costs, and hospitalization costs as shown in Table 2. Mean direct medical costs of the patient each time they visited an OPD was Rs. 505.50 ± 143.69. The mean costs of medications per month was Rs. 1,164 ± 324.48 and the mean hospitalization costs each time for those who have been hospitalized in the past was Rs. 11,535.71 ± 7,268.11.

Direct nonmedical costs

Direct nonmedical costs included in this study were transportation costs and costs of food. Human capital approach was used to sum up the total direct nonmedical costs for transportation costs and costs of food separately. The mean costs of transportation each time the respondents visited a health-care center or hospitals was Rs. 155.50 ± 41.99 and the mean costs of food each time respondents visited a health center or hospitals was Rs. 261 ± 32.75 as shown in Table 3.

Total direct costs

Each category of direct medical costs was summed up to get the total direct medical. Transportation costs and cost of food were also summed up to get the total direct nonmedical costs. The mean and standard deviation for direct medical and direct nonmedical costs were computed and the Table 4 is the results for the same. The mean total direct medical costs that include OPD costs, medications costs, and hospitalization costs was Rs. 29,885 ± 11,995.33 and the mean total direct nonmedical costs that include transportation costs and costs for food was Rs. 7,441.25 ± 2,228.90.

Comorbidity status and direct medical costs

The Table 5 illustrates that the mean total direct medical costs of COPD patients with comorbidity was Rs. 28,148.23 ± 2,578.01 and for those without comorbid illness was Rs. 13,460.00 ± 1,255.38. This table shows that total direct medical costs were higher in patient with comorbid illness in comparison to those without any comorbid condition.

Indirect costs

Table 6 illustrates the indirect costs that include absence from work (absenteeism) and lack of productivity at workplace (presenteeism). The observed mean absenteeism in the past 28 days was 193.50 ± 33.62 h. Relative absenteeism was expressed as a percentage of expected hours and ranges between a negative number (works more than expected) and 1.0 (always absent) and the mean relative absenteeism of the respondents is 0.89 ± 0.13, which shows that respondents missed their work about 89% of the time. Presenteeism is a measure of actual performance in relation to possible performance. Measures of absolute presenteeism is quite opposite to absolute absenteeism, absolute presenteeism has a lower limit of 0 (total lack of performance during time on the job) and an upper limit of 100 (no lack of performance during time on the job). The mean absolute presenteeism of respondents is 72.05 ± 7.55, which means that only about

Table 2: Direct Medical cost per hospital visit

| Variables | Mean±SD (INR) |
|--|------------------|
| OPD visits costs (Each time) | 505.50±143.69 |
| Medication costs (Per month) | 1164±24.48 |
| Mean hospitalization costs (Each time) | 11535.71±7268.11 |

OPD: Out-Patient Department; INR: Indian Rupee; *expressed as mean (SD)

Table 3: Direct non-medical costs per hospital visit

| Variable | Mean±SD (INR) |
|----------------------------------|---------------|
| Transportation costs (Each time) | 155.50±41.99 |
| Food (Each time) | 261±32.75 |

INR: Indian Rupee; *expressed as mean (SD)

Table 4: Total direct costs

| Variables | Mean±SD (INR) |
|--------------------------------|-----------------|
| Total direct medical costs | 29885±11995.33 |
| Total direct non-medical costs | 7441.25±2228.90 |

INR: Indian Rupee; *expressed as mean (SD)

Table 5: Co-morbidity status and mean total direct medical costs

| Variables | Number and percentage | Mean±SD (INR) |
|----------------------|-----------------------|-----------------------|
| With co-morbidity | 17 (70.8%) | 28148.2353±2578.01580 |
| Without co-morbidity | 7 (29.2%) | 13460.0000±1255.33528 |

INR: Indian Rupee; *expressed as mean (SD); †expressed as numbers (%)

Table 6: Indirect costs

| Variables | Mean±SD |
|---|--------------|
| Absolute Absenteeism (In number of days) | 193.50±33.62 |
| Relative Absenteeism (In number of days) | 0.89±0.13 |
| Relative hours of work (in hours) | 0.10±0.13 |
| Absolute Presenteeism (In number of days) | 72.05±7.55 |
| Relative Presenteeism | 0.85±0.08 |

Table 7: Correlation between duration of illness and total direct medical costs

| variables | Mean±SD | r | P |
|----------------------------|----------------------|-------|-------|
| Duration of illness | 3.5±2.5 (Years) | | |
| Total direct medical costs | 29885±11995.33 (INR) | 0.501 | 0.013 |

INR: Indian Rupee; *expressed as mean (SD)

72.05% the respondents shows no lack of performance in during time of job.

Correlation between duration of illness and total direct medical costs

This study was also interested in knowing whether duration of illness can influence direct medical costs or not. A Pearson correlation was computed to determine the relationship between duration of illness and total direct medical costs as displayed in Table 7. There was a moderate, positive correlation between duration of illness and total direct medical costs, which was statistically significant ($r = 0.501$, $P = 0.013$). Figure 2 is a scatter plot depicting correlation between duration of illness and total direct medical costs.

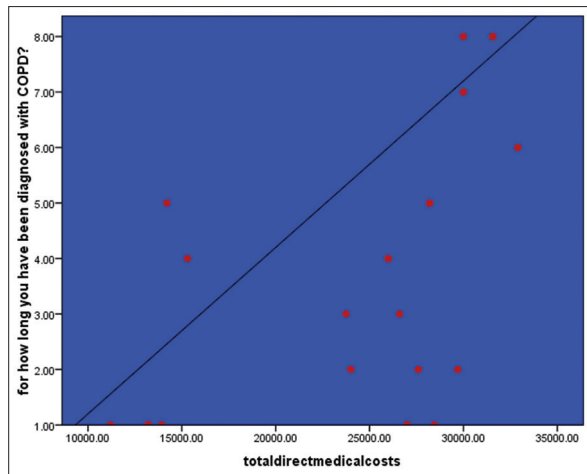


Figure 2: Scatter plot depicting correlation between duration of illness and direct medical costs

Discussion

The present study was designed to estimate the direct and indirect costs of COPD or the economic impact of COPD, data were obtained using a structured questionnaire to assess direct and indirect costs of COPD, and questions related to sociodemographic of the target population was used to determine the characteristics of the sample population. This study also encompassed comorbidity in patient with COPD and how comorbidity acts as driver that escalates the economic impact of COPD. According to this study, the mean direct medical costs of the respondents in the past 12 months related to COPD (in which cost of medication, cost of OPD visits, cost of previous hospitalization was incorporated together) was Rs. 29,885 ± 11,995.33 and the for direct nonmedical costs (transportation costs and food) it was Rs. 7,441.25 ± 2,228.90. A recent study by Patel *et al.*, which was conducted in Ahmedabad, Gujarat, India for a period of 6 months shows that the mean direct medical costs related to COPD Rs. 2,418.12 ± 839.73 and direct nonmedical costs was Rs. 528.01 ± 212.72, measured at one point in time.^[8]

The current reported that the medication cost is one of the major factors that lead to an increase in the economic impact of COPD. This finding was also supported by Wilson *et al.* who reported that medications cost accounts the second largest costs of COPD that contributes about 35% to the total costs^[9] and Izquierdo-Alonso *et al.* who also reported that medications has an enormous impact on costs of COPD and accounts to about 38% of the direct medical costs of COPD and this costs varies with stages and severity of the disease.^[10]

Kallaru *et al.* reported the mean costs of COPD and its relation to the severity of the diseases in South India. The mean cost for stage II COPD patient was Rs. 3,179.62 ± 99.01 per visit, stage III was Rs. 16,414.79 ± 8,365.79, and stage IV was Rs. 44,077.16 ± 15,686.21 per visit. This study vividly shows that disease costs increase with the severity or intensity of illness.^[11]

The present study also looked at the indirect costs of COPD in the form of loss of productivity in workplace and absenteeism. Though very few studies were available related to the indirect costs of COPD in India and even in South East Asia as whole, but many studies that were conducted elsewhere shows that indirect costs related to COPD such as lack of productivity, loss of pay, etc., are some of the factors that contribute to an increase in the economic burden of COPD. Patel *et al.* reported that indirect costs contribute about 27–61% of the total costs of COPD among working population and about 13–18% of employee with COPD reported exhibits a limitation in the amount and type of work they normally do.^[12]

This study also looked at the duration of illness and how it correlates with direct costs and the results that were obtained shows that there was a moderate positive correlation between duration of illness and total direct medical costs. Very few studies addressed the duration of illness and direct medical costs but it was reported as statistically significant in few studies that looked at it.

The limitation with this study was that the total sample size was not achieved, as many of the patients who were identified as subjects were either retired or has not been working for more than a month, so they were excluded from the study, hence sample size was compromised as we are also looking at loss of productivity at work place and absenteeism. The indirect cost was not reported in monetary term.

Conclusions

The total direct cost of illness of COPD patients increased with duration of illness and presence of comorbidity. The major drivers of the total cost were cost of hospitalizations and medication costs. From review of literature, acute exacerbations appear to be one of the reasons for hospitalization. Therefore, focus should be inclined toward prevention of acute exacerbations and thereby reducing the costs of hospitalization and medication costs. Acknowledging the costs and economic impact of COPD is therefore extremely important in the management of COPD, reducing the mortality and morbidity related to COPD and in improving adherence to treatment. As we have seen that the economic impact of COPD is extremely high, hence focus should be inclined toward the economic impact of COPD and its effect on the well-being of the patient and family.

Recommendation

Research scope: It is essential to obtain a complete picture of the economic impact of COPD from various perspectives. Therefore, further studies on this topic from various perspectives are necessary to answer the unknown questions on the economic impact of COPD. Qualitative study for in-depth understanding on the financial crisis faced by the patients and family as a result of chronic illness maybe helpful in understanding the economic consequences of COPD in a broader perspective. Economic evaluation on COPD management to promote a

more cost-effective treatment for COPD patients. Health system: Tobacco control program and strict implementation, monitoring, and evaluation of tobacco act can to quite an extent reduced the prevalence of COPD. COPD care should be incorporated as a part of primary health-care services.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Goldcopd.Org. Global initiatives for Chronic Obstructive Lung Disease, Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease, Inc.; c2014. Available from: http://www.goldcopd.org/uploads/users/files/GOLD_Report_2014_Jan23.pdf. [Last accessed on 2014 Dec 17].
2. WHO. Chronic Obstructive Pulmonary Disease. WHO; 2014. Available from: <http://www.who.int/mediacenter/factsheets/fs315/en/>. [Last retrieved on 2014 Dec 17].
3. Puneekar YS, Shukla A, Müllerova H. COPD management costs according to the frequency of COPD exacerbations in UK primary care. *Int J Chron Obstruct Pulmon Dis* 2014;9:65-73.
4. Di Bonaventura M, Paulose-Ram R, Su J, McDonald M, Zou KH, Wagner JS, *et al.* The burden of Chronic Obstructive Pulmonary Disease among employed adults. *Int J Chron Obstruct Pulmon Dis* 2012;7:211-9.
5. Perera PN, Armstrong EP, Sherrill DL, Skrepnek GH. Acute exacerbations of COPD in the United States: Inpatient burden and predictors of costs and mortality. *COPD* 2012;9:131-41.
6. Essue B, Kelly P, Roberts M, Leeder S, Jan S. We can't afford my chronic illness! The out-of-pocket burden associated with managing Chronic Obstructive Pulmonary Disease in Western Sydney, Australia. *J Health Serv Res Policy* 2011;16:226-31.
7. Absenteeism and presenteeism questions of the World Health Organization's Health and Work Performance Questionnaire (HPQ).
8. Patel KD, Lalwani T, Shah K. Economic burden in direct cost of Chronic Obstructive Pulmonary Disease at a tertiary care teaching hospital: A prospective observational cohort study. *Indian J Pharm Pract* 2014;7:61-8.
9. Wilson L, Devine EB, So K. Direct medical costs of Chronic Obstructive Pulmonary Disease: Chronic bronchitis and emphysema. *Respir Med* 2000;94:204-13.
10. Izquierdo-Alonso JL, de Miguel-Diez J. Economic impact of pulmonary drugs on direct costs of stable Chronic Obstructive Pulmonary Disease. *COPD* 2004;1:215-23.
11. Kallaru H, Nagasubramanian VR, Balakrishnan HP, Gopal K, Palani T. Impact of severity of the disease on cost of illness and quality of life of patients with Chronic Obstructive Pulmonary Disease. *J Young Pharm* 2015;7:106-12.
12. Patel JG, Nagar SP, Dalal AA. Indirect costs in Chronic Obstructive Pulmonary Disease: A review of the economic burden on employers and individuals in the United States. *Int J Chron Obstruct Pulmon Dis* 2014;9:289-300.