

Economic Burden of Chronic Obstructive Pulmonary Disease (COPD) in India: A Systematic Literature Review

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Background

- COPD affects over 213 million people worldwide and is the 3rd leading cause of death globally, causing 3.7 million deaths in 2021.^[1]
- India bears a disproportionate burden with 55.3 million COPD cases (4.2% prevalence) as of 2016, accounting for 32% of global disability-adjusted life years (DALYs) from chronic respiratory diseases, despite having only 18% of the world's population.^[2]
- COPD is the 2nd leading cause of death and DALYs in India, with mortality rates of 98 per 100,000 population: this is 3x higher than the United States. DALYs per COPD case is 1.7 x global average.^[3]
- Air pollution, especially biomass fuel exposure, surpasses smoking as the leading risk factor for COPD in India.^[4]
- Hospitalization accounts for 75% of COPD management costs, and patients experience frequent exacerbations requiring repeated healthcare utilization.^[4]
- Despite the substantial clinical and economic impact of COPD in India, there remains a critical knowledge gap regarding comprehensive economic evaluations, cost-effectiveness analyses, and healthcare resource use patterns from published literature.

Objectives

- To critically examine the scope and drivers of the economic burden of COPD in Indian adults, including costs, cost-effectiveness, and healthcare resource use.

Methodology

Eligibility Criteria

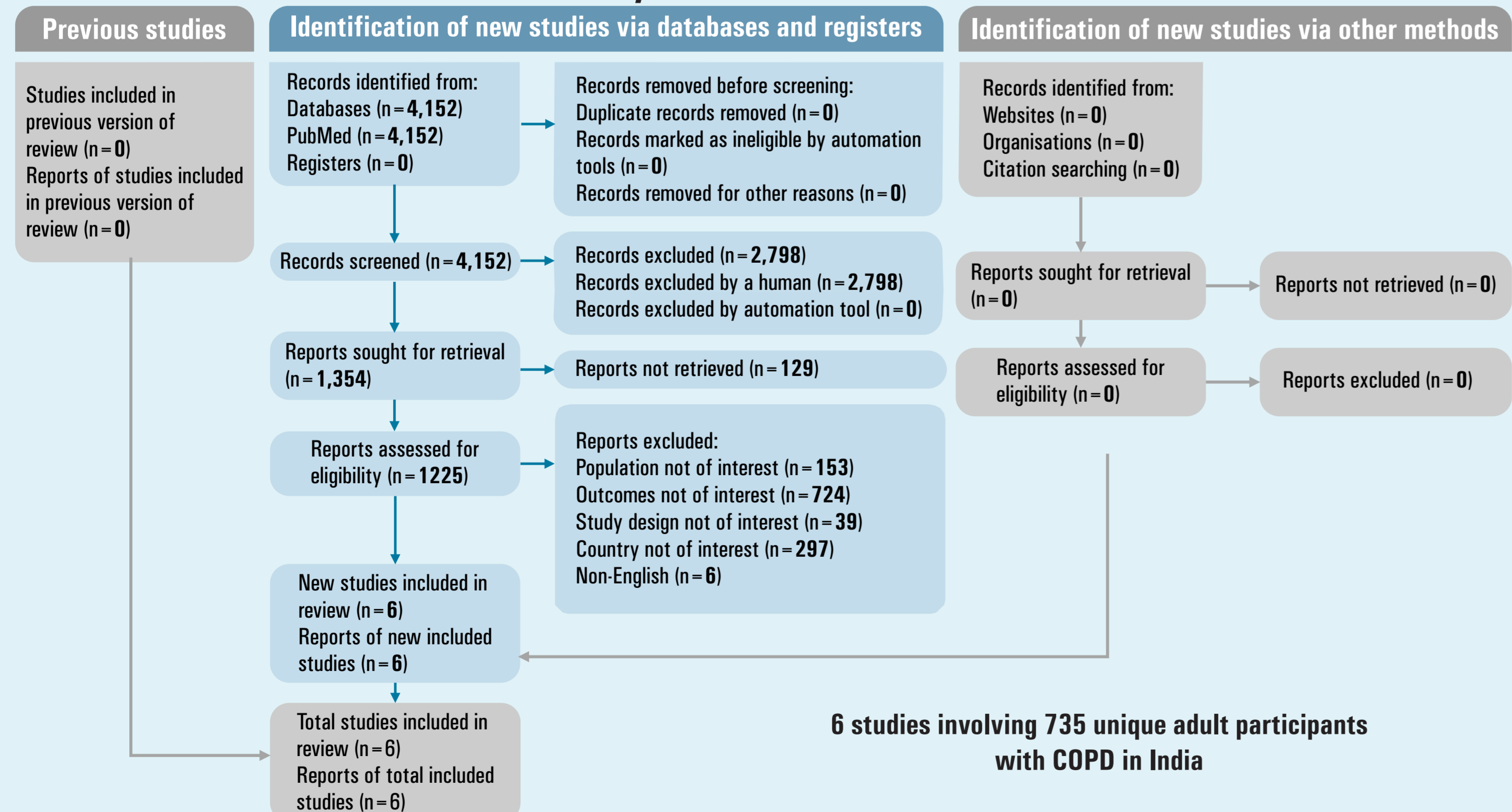
Facet	Inclusion	Exclusion
Population	Adult patients diagnosed with chronic obstructive pulmonary disease	Patients without COPD Pediatric population
Intervention and Comparators	Any/ none	No exclusions based on intervention/comparators
Outcomes	Costs <ul style="list-style-type: none"> Total cost of illness, including direct costs, indirect costs, other reported costs, and productivity loss Cost-effectiveness <ul style="list-style-type: none"> As reported through measures such as cost per QALY/ DALY, ICER, willingness to pay, life year gain (LYG), and other cost-effectiveness measures Healthcare resource utilization: <ul style="list-style-type: none"> As reported through measures such as: <ul style="list-style-type: none"> Hospitalization, length of hospital stay, OP visit, ER visit ICU admission, length of ICU stays, re-admission to ICU Utilization of lab, imaging, and other tests Other healthcare resource utilization measures 	Outcomes other than those listed
Study design	Economic modelling-based analysis: <ul style="list-style-type: none"> Including cost-effectiveness analysis, cost utility analysis, cost benefit analysis, cost minimization analysis, budget impact analysis, and other modelling studies RCTs that report cost/ cost-effectiveness/ HCRU RWE studies including prospective and retrospective observational studies, cross-sectional studies, cohort studies, etc., that report cost/ cost-effectiveness/ HCRU Burden of illness studies 	
Language	English language articles	Non-English
Time frame	Articles published after 01 September 2014	Older
Country	India	Other countries

The systematic literature review (SLR) adhered to the PRISMA 2020 guidelines.

- Literature sources:** PubMed; reference lists of identified SLRs for additional potential studies
- Screening protocol:** Fully human, dual independent review with reconciliation; two levels (title-abstract, full-text)
- Data extraction:** Based on a standardized data extraction template.
- Risk of Bias:** Using appropriate scales, such as RoB 2 for RCTs, the Newcastle-Ottawa Scale for observational studies, and the Consensus-based checklist for cost of illness studies.

Results

Study Selection Flowchart



Study and Patient Characteristics

- Study designs**
 - Open-label RCT: 01
 - Cross sectional: 02
 - Prospective observational: 02
 - Economic evaluation: 01
- Study location and patients**
 - Total patients: 735; sample size ranged from 24 to 260 patients
 - Manipal, Karnataka, South India: 02 studies (N=260+24=284)
 - Hyderabad, Telangana, South India: 01 study (N=90)
 - Srinagar, Jammu and Kashmir, North India: 01 study (N=129)
 - Pan India (Kolkata-Mumbai-Bangalore-Delhi): 01 study (N=232)

Demographics

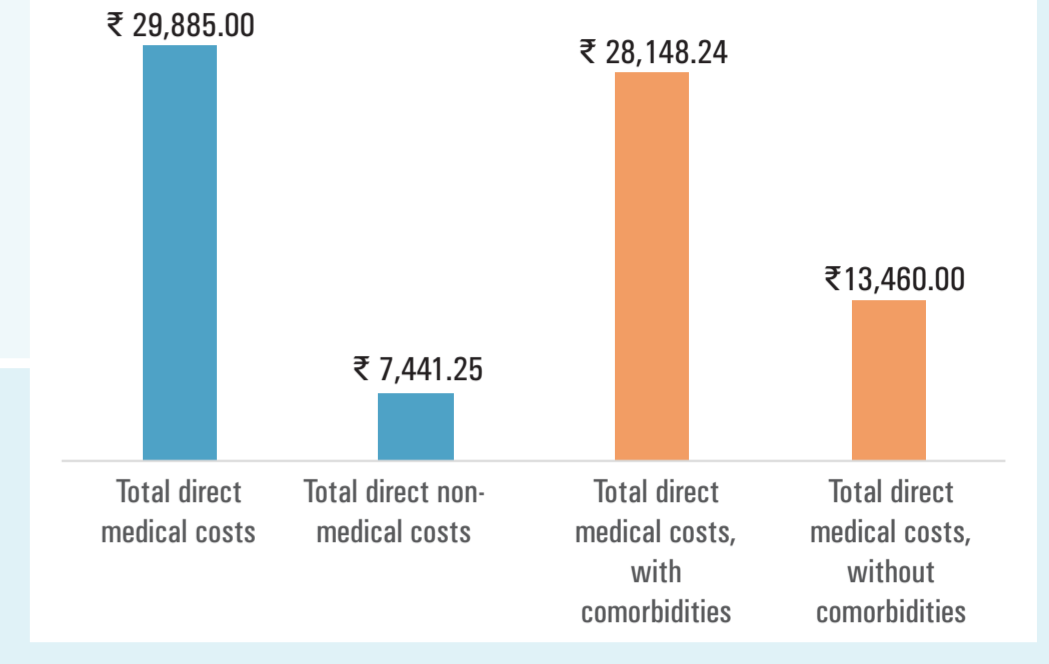
- Age:** Mean age ranged from 59.4 years to 68.0 years (4 studies)
- Sex:** Male preponderance was observed: 570, 80.2% (4 studies)
- Disease duration:** Mean disease duration ranged from 2.95 years to 15.3 years (3 studies)

Risk of bias

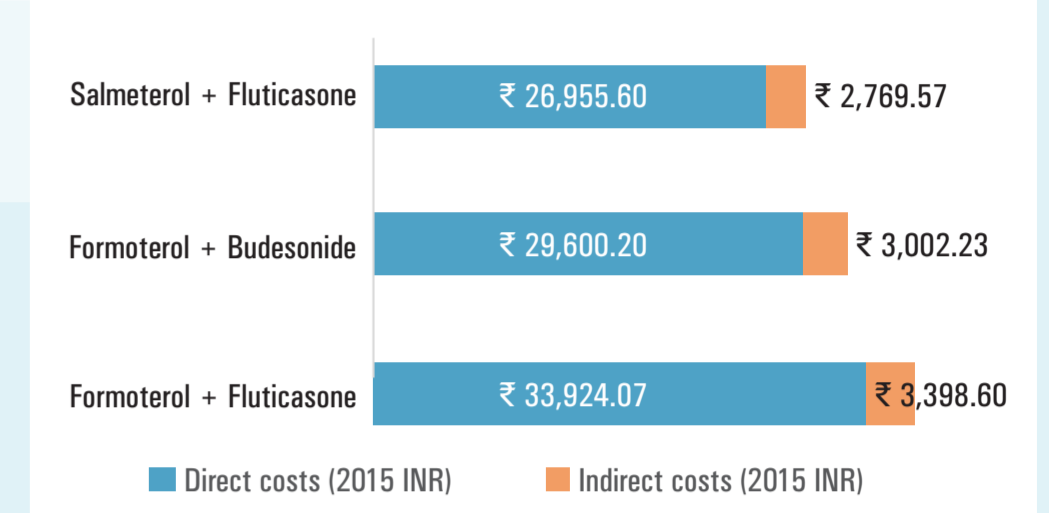
- RCT (N=1): low risk of bias (RoB-2)
- Cross sectional and observational studies (N=4): fair standard (NOS)
- Economic evaluation (N=1): reported 20/28 CHEERS 2022 items

Cost

- Lakiang et al, 2018:** In 12-months period:
 - Direct medical costs constituted 80.06% of total costs
 - Direct medical costs with comorbidities were more than twice compared to those without comorbidities
- Altaf et al, 2015:** Costs increased nearly eightfold with exacerbation severity:
 - Moderate exacerbation:** ranged from INR (2015) 1,875 to 2,576
 - Severe exacerbation:** ranged from INR (2015) 13,286 to 19,883

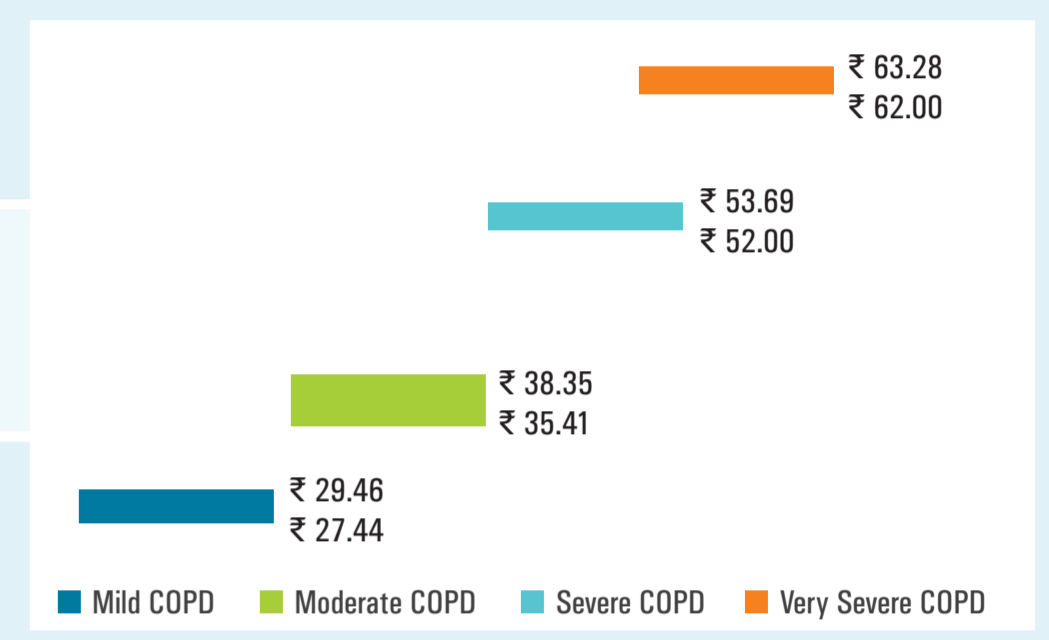


- Altaf et al, 2015:** Irrespective of treatment, direct medical costs constituted > 90% of total costs for COPD management



Main drivers of COPD costs:

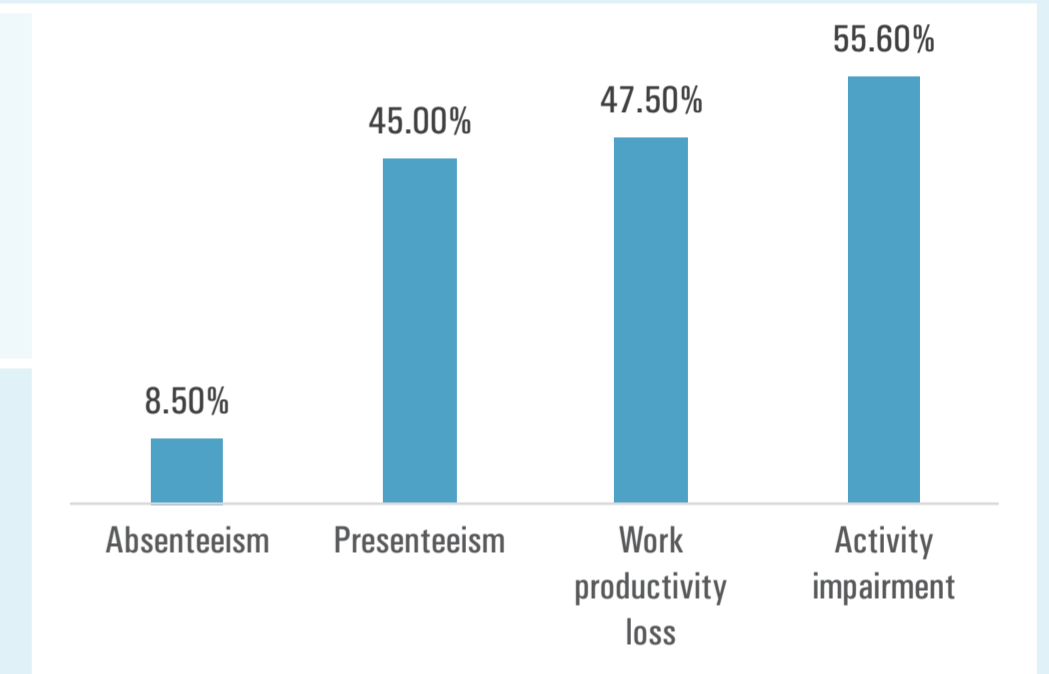
- Ghoshal et al, 2016:** Medication use was the main driver of direct costs; Specialist and GP visits were the main drivers of non-medication direct expenses
- Lakiang et al, 2018:** Cost of hospitalizations and medication costs. In fact, a direct, positive correlation was found between duration of illness and total direct medical costs (p < 0.05)



- Abdulsalim et al, 2020:** 6-month median medicine costs were directly dependent on the severity of COPD

Loss of productivity

- Ghoshal et al, 2016:** Activity impairment, work productivity loss, and presenteeism contributed more compared to absenteeism among patients with COPD. This translated to a mean yearly lost productivity of USD 650 per patient.
- Koul et al, 2019:** COPD resulted in missed work amounting to INR 2,123 per patient per hospitalization
- Lakiang et al, 2018:** Over 28 days, COPD resulted in considerable workplace economic implications:
 - Mean absolute absenteeism of 193.50 hours
 - Mean absolute presenteeism of 72.05 hours



Healthcare Resource utilization

- Altaf et al, 2015:** 4.5% to 6.6% of all COPD patients required hospitalization
- Lakiang et al, 2018:** 54.2% COPD patients reported previous hospitalization
- Altaf et al, 2015:** Mean Length of hospitalization ranged from 4.8 to 7.4 days (Altaf 2015, N=90)
- Ghoshal et al, 2016:** 5.2% patients required ER visit

Cost effectiveness

- Patel et al, 2015:** A decision tree was used to compare the cost-effectiveness of the use of ward-based non-invasive positive pressure ventilation (NIV) plus standard treatment to standard treatment alone in COPD-related respiratory failure patients treated in Indian hospitals without ICU care. Future costs were discounted at 3%. All costs were reported in USD (2012). One-way, two-way, and probabilistic sensitivity analysis were performed. The time horizon was lifetime and perspective was societal.

Strategy	NIV + standard care	Standard care alone
Cost (2012 USD)	535.06	636.33
Incremental cost (2012 USD)	--	101.27
Mortality rate	0.101	0.278
QALY	6.82	8.49
Incremental QALY	--	1.67
Cost per QALY gain (2012 USD)	78	75
ICER (USD per QALY)	--	61

- Since the **ICER was substantially lower than the gross domestic product (GDP) per capita for India (2012: 1489 USD)**, the study concluded that ward-based NIV treatment is cost-effective in India, and may increase survival of patients with COPD respiratory failure when ICU is not available.

Discussion

- Evidence vacuum:** Despite screening > 4,000 records, only six eligible studies over an entire decade exposes a startling gap in India-specific COPD cost evidence: this is untenable for a disease ranked 2nd nationally in mortality and DALY burden.
- Neglected cost-effectiveness evidence:** Only one cost-effectiveness analysis was identified in ten years, underscoring an urgent deficit in economic evaluation research to inform rational therapy choices, reimbursement, and value-based care.
- Direct costs dominate:** Across available data, ~80% of total COPD expenses stem from direct medical costs, chiefly hospitalizations and medications, revealing limited cost containment and weak financial protection mechanisms.
- Hidden productivity losses:** Indirect costs are poorly documented, yet existing studies show large productivity losses, mainly due to presenteeism and absenteeism, among patients still in their working years, highlighting a societal blind spot in COPD burden estimation.
- Urban-rural divide:** Current data are drawn primarily from urban centers in seven states, excluding rural and high-exposure regions where biomass fuel and poor access to care likely magnify both disease and cost burdens, indicating a major equity failure.
- Policy inertia:** Public health financing remains misaligned with COPD realities. AB-PMJAY covers inpatient episodes but excludes outpatient and long-term pharmacotherapy, forcing patients to self-fund chronic care:^[5] this, despite outpatient costs constituting most of India's OOP expenditure.
- Need for systemic cost surveillance:** Absence of standardized cost frameworks and real-world expenditure registries prevents value-based decision-making. India urgently needs national COPD cost databases and structured health-economic evidence to guide policy and pricing.
- Limitations:** Review restricted to English-language PubMed studies; probable under-reporting of exacerbations; data mostly urban and limited to seven states, restricting generalizability.

Conclusion

COPD imposes substantial direct and productivity costs in India, amplified by comorbidities and severe exacerbations, and driven by hospital care and medications. However, with only six studies in a decade, the evidence base remains thin. Generating robust, real-world cost data must be a national priority to enable cost-efficient COPD care.

References

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