Original article

Socio-demographic factors of COPD mortality in India

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ABSTRACT

Objective: The epidemiology of Chronic Obstructive Pulmonary Disease (COPD), one of the major killers in India, has been inadequately studied. There is dearth of national data and analysis on its associates. The present article aims to find out socio-demographic factors associated with it.

Materials and methods: Data taken from National Family Health Survey (NFHS 4) (2015-16), Global Adult Tobacco Survey (GATS) 2: India 2016-17 and India: Health of the Nation's States were analyzed with scatter plot and multivariate regression.

Results: COPD mortality has negative relationships with use of clean fuel and economic condition and positive relationships with smoking and Second Hand Smoking (SHS). On regression, use of clean fuel reduces and SHS at home increases COPD deaths.

Conclusion: For preventing deaths from COPD, focus should be on up scaling use of clean fuel and improvement in economic condition.

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD), a progressive disease of the respiratory tract, is responsible for 3.17 million deaths worldwide. More than 90% of these deaths occur in low and middle income countries. Another 251 million people are suffering from the disease globally.[1] Considered as a preventable disease, it causes 8.7% of the total deaths in India and morbidity to 55.3 million people, contributing 4.8% of Disability Adjusted Life Years (DALY) in the country. In fact, from 1990 to 2016, the crude prevalence of COPD has increased by 29%.[2] As Sustainable Development Goals look to reduce premature mortality from Non Communicable Diseases (NCD) including COPD by one third by 2030, it is vital to identify the modifiable risk factors and address them strategically.

Various studies conducted at different parts of the country brought focus on this chronic respiratory disease. However, only a handful of them used spirometry as mode of diagnosis, thereby limiting the scope of further utilization of the study findings.[3] Different factors have, by now, been implicated in the causation of COPD deaths, tobacco and air pollution being two major preventable causes amongst them. It has been calculated that three fourth of the DALY contributed by COPD could be ascribed to these two factors.[2] Not only smoking, exposure to second hand smoking (SHS) has also been responsible for precipitating COPD.[4] The role of financial condition for deciding the outcome of the disease was also established. In fact, there are several other factors like presence of diagnostic facility and treatment options which decides access to treatment and subsequent outcome.

In an effort to find out the associates of COPD mortality, the present paper aims to analyze certain socio-demographic factors.

The objective was to find out if there is any association between COPD and smoking, smokeless tobacco, use of clean fuel, per capita income and exposure to SHS in Indian population.

2. Materials & methods

National Family Health Survey (NFHS 4) (2015-16), Global Adult Tobacco Survey (GATS) 2: India 2016-17 and India: Health of the Nation's States – these three reports were used for collecting data on all the variables.[5–7] While NFHS is conducted at an interval of 5–10 years, GATS 2 was conducted 7 years after GATS 1. The report India: Health of the Nation's States is based on Global Burden of Disease Study (GBD) 2016.

Among different factors, smokeless tobacco (SLT) use, smoking, SHS at work and home, mortality rate due to COPD, clean fuel and Net State Domestic Product (NSDP), as parameter for economic condition for different states were taken into account. NFHS 4 considered people between 15 and 49 years while GATS 2 considered people aged 15 years or above. Tobacco use considers both smoking and SLT. Clean fuel indicated electricity, Liquid Petroleum Gas (LPG)/natural gas and biogas. Data on NSDP for 2015-16 were taken from Ministry of Statistics and Programme Implementation, India.[8]

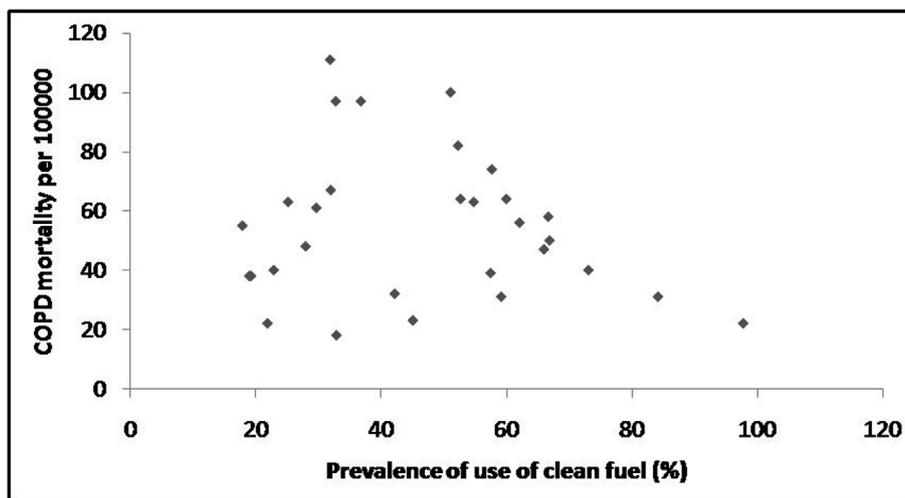Scatter plot was used for testing association between death rate of

Fig. 1. Use of clean fuel and COPD mortality in India.

COPD and independent variables. Multivariate regression was used for finding out factors determining mortality rate due to COPD. Tobacco use, being a composite variable for SLT use and smoking, was not considered for regression. P value < 0.05 was considered significant. Predictive Analytics SoftWare (PASW) for Windows software was used.

3. Results

The highest and lowest mortality rate were recorded in Rajasthan and Nagaland (111/100,000 population and 18/100,000 population, respectively). Most of the states with high death rates were in north India. Highest smoking rate was noted in Mizoram (34.4%) and Meghalaya (31.6%). Highest tobacco use was seen in Tripura (64.5%) and Mizoram (58.7%). Mizoram (84.1%) and Meghalaya (76.8%) recorded highest exposure to SHS at home while Jammu and Kashmir and West Bengal (both 57.5%) saw highest exposure to SHS at work.

Negative relations of COPD mortality was noted with use of clean fuel (Fig. 1) and economic condition (Fig. 2). Smoking and SHS share positive relationship with COPD deaths.

On regression, SHS at home increases and use of clean fuel reduces COPD deaths, although the relationships were not significant. SLT use was significantly associated with COPD deaths (p = 0.011).

After controlling for other variables, higher income, too, was seen to

Table 1
Multivariate analysis for COPD burden in India.

Variables	Regression coefficient (B)	95.0% Confidence Interval	P value
Smokeless tobacco use	− 1.218	− 2.129 – (−) 0.306	**0.011**
Smoking	− 0.172	− 2.110–1.766	0.856
Per capita NSDP (2015–16)	0.000	0.000–0.000	0.240
Clean fuel	− 0.177	− 0.960–0.607	0.645
SHS at home	0.449	− 0.318–1.215	0.238
SHS at work	− 0.509	− 1.600–0.582	0.345

SHS = Second Hand Smoking.
NSDP = Net State Domestic Product.

reduce COPD mortality (Table 1).

4. Discussion

COPD is set to become third leading cause of death globally by 2030.[9] However, for estimating the burden, there is lack of consensus about working definition, thus preventing uniformity is research protocols. In one meta-analysis, no study was found to estimate such prevalence of COPD in the country.[10] GBD tried to fill in that gap in
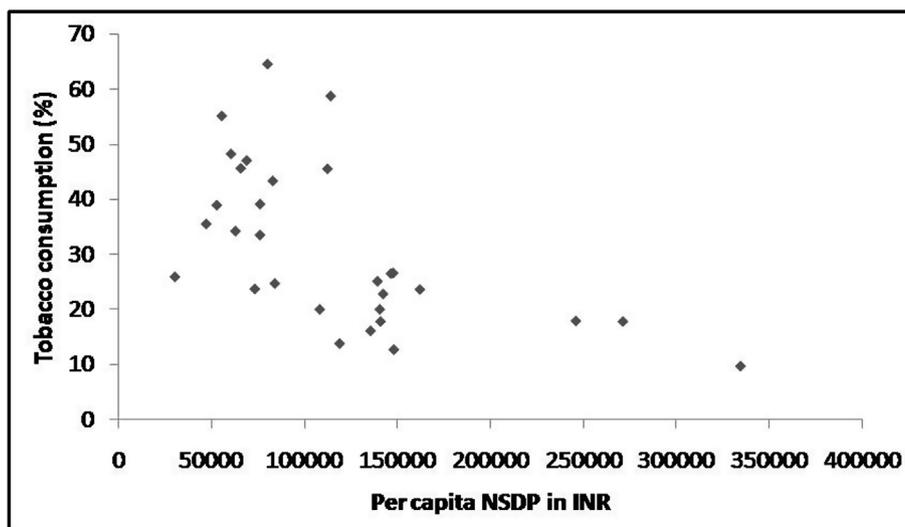

Fig. 2. Per capita National State Domestic Product and tobacco consumption in India.

epidemiology.

Earlier researchers found that COPD mortality and smoking prevalence do not always coincide.[11,12] The present study demonstrated the same, with states like Meghalaya and Arunachal Pradesh recording lower death rates from COPD, suggesting multi-factorial causation, particularly at a time when air pollution is causing higher deaths than smoking. COPD is 3–5 times more likely to occur in smokers.[13] Among different factors, duration of smoking seems to be an important one.[14] Quitting smoking helps in prolonging survival, as evident from previous researches, probably by relieving emphysema.[14,15] As India documented a reduction in smoking prevalence from 34.6% to 28.6% among citizen aged 15 years and older, it is expected to reduce the burden of COPD in future.[6] Since SHS increased the risk of COPD mortality, the benefit of smoking reduction could be multifold.[16,17] National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), India's response to rising NCD burden, brings COPD under its umbrella in 2016 and provides preventive and curative care to the clients through NCD Clinics at state and district level.[18]

Air pollution also plays crucial role for COPD mortality and morbidity. Non-smokers females in developing countries fall prey to compromise in indoor air quality from using biomass fuel for cooking.[19] It has been estimated that exposure to air pollution from cooking contributes to 925,000 premature deaths in India annually.[20] Poor ventilation, long duration spent in kitchen may in fact increase such exposure. One meta-analysis expressed concerns on the extent of indoor fuels and inadequate ventilation.[10] All these observations necessitate replacement of biomass fuel with a cleaner substitute. Ujjwala scheme in India aims just the same, by introducing LPG at the farthest corners of the country, with the hope that in the long run, the burden of COPD and other NCDs will come down. This has serious implications on household health and financial burdens as it would reduce loss of wages, besides decreasing medical expenditure.[21] Notably, the state with highest death rate from COPD (Rajasthan, with 111/100,000 population) has a poor coverage of clean fuel (31.8%).[7] With a study from Ludhiana reporting higher frequency of COPD in industrial areas, the role of outdoor air pollution could again be highlighted.[22] Such pollution has also been implicated in rise in hospital admissions and death from COPD.[23] It may be mentioned that for COPD patients, existing air quality guidelines need to be tightened, as suggested by Liu.[24] In addition, there is need to check the extent of stubble burning and vehicular pollution in north India, with studies pointing at air pollution for exacerbating COPD cases.[25,26]

In India, the most common form of tobacco use is chewing paan mashala/guthka (betel quid, areca nut).[5] Many people switch to SLT, in an effort to quit tobacco. In a study on such switcher, the risk of dying from COPD was found greater than quitters, even after controlling for age and other confounders.[27] Nasal use of snuff has also been seen to precipitate chronic bronchitis, a variant of COPD.[28] In south east Asia, disadvantaged groups are more prone to be exposed to SLT.[29] Inexpensive nature and social acceptability, after being added with lack of regulatory mechanisms for household production of SLT, probably makes it a client for silent epidemic.[30] There is need for putting enormous efforts for social awareness to fight this widespread problem.

Financial condition is a close determinant of COPD outcome. With rise in the income, COPD deaths fall.[12] During economic downturn, Greece witnessed a hike in non-adherence of treatment, frequent exacerbations and more hospitalizations.[31] In fact, provisions like spirometry and opinion from pulmonologists are lacking at the level of primary care in our country, thereby rendering the care to the COPD patients suboptimal.[32] Probably a high number of cases remain undiagnosed, too, warranting a change in policy level for making spirometry available at the primary care setting for addressing the unmet needs in health care. Till such things happen, emphasis must be there for identifying high risk cases and referring them to centres equipped with spirometry.[33] At the individual level, patients from lower socio-

economic status usually presented late, with more frequent hospitalizations and higher mortality.[34,35] At least four states (Rajasthan, Uttar Pradesh, Jammu and Kashmir, Tripura), from the present study, are there with low per capita income and high COPD deaths, suggesting that intervention for uplifting socio-economic status might reduce COPD mortality there.

The present paper brings some standard data sets together to analyze the associates of COPD deaths in India. Absence of such efforts in literature is one of the strength of this article. Consideration of data on smoking, tobacco use, passive smoking at home and work separately with mortality data is another unique dimension of this study, by which it attempts to cover the full spectrum of tobacco and COPD. Being an ecological study, it was beyond the scope to determine temporal relationship between COPD death and related factors. Longitudinal study could be planned to determine the effect of PM2.5 on occurrence of COPD or related deaths. The study did not have data on airflow obstruction, an important factor for COPD epidemiology. There may be other NCDs co-existing in COPD patients, thus influencing their survival. In fact, one study suggested that co-morbidities are more likely to cause death than COPD itself.[36] Considering those factors was not possible in the present paper. To conclude, lack of multi-state study on COPD using standard methodology is the need of the hour to estimate the burden accurately. It should also take care of the related variables. In addition, for reducing deaths due to COPD, there is need for prevention at primary, secondary and tertiary level, with due emphasis on rehabilitation. Upcoming strategy should concentrate on the same.

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Nil.

Declaration of competing interest

No.

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