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Factors associated with mortality from lung cancer in India

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A B S T R A C T

Objective: Lung cancer is the most common cancer in the world. There is scarcity of research papers at national level on its sociodemographic dimensions. The present paper aims to correlate death from lung cancer with certain demographic factors. *Methods:* Retrieved data from National Family Health Survey 4, Global Adult Tobacco Survey 2: India 2016-2017 and India: Health of the Nation's States were analyzed, as state and/or Union Territories unit of analysis. Spearman correlation coefficient and multivariate linear regression were used for finding out association with smoking, smokeless tobacco, alcohol consumption, second hand smoking, per capita income and use of clean fuel. *Results:* Except Kerala, most of the states with higher death rate were confined to north India. Smoking ($r = 0.575$, $P = 0.001$), SHS at home and work ($r = 0.476$, $P = 0.008$ and $r = 0.374$, $P = 0.042$, respectively) were significantly related to deaths from ca lung. On regression, clean fuel was found significantly associated with ca lung mortality. *Conclusion:* There is need to put emphasis on tobacco cessation and primary prevention of smoking.

A R T I C L E I N F O

Keywords: Lung cancer; India; Mortality rate; Smoking; Tobacco

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Introduction

Lung cancer, the most common cancer, kills 1.76 million people every year. In India, with a mortality rate 5/100,000, it is responsible for 63,475 deaths annually.[1] It is responsible for 7.5% of cancer Disability-Adjusted Life-Years (DALY) in the country. Out of 27 population based cancer registry, 10 in the country have recorded lung ca as the most common cancer in males.[2] In males, it is the most common cancer, with 10.4% and in females, it stands at seventh place, with 4.4% contribution to cancer DALY.[3] For management of cancers, Tertiary Cancer Care Centres were set up across the country and prevention of risk factors was put forward at the primary care level with due emphasis.

Still, an estimated 74,000 prevalent ca lung cases were recorded in 2016.[3] Being a cancer with high fatality rate, there is need to have early diagnosis as the main stay of treatment. In fact, the primary need might be to understand its epidemiology in Indian population to contain it. Unfortunately, cancer registries are mostly urban in nature, thus not being able to deliver a true picture of the rural parts. Few studies earlier linked smoking and air pollution with this cancer.[3,4] In addition, economic condition, alcohol and diet were also claimed to have some important role in its distribution.[5]

In a sincere effort, India has recorded a reduction in prevalence in smoking.[6] However, there are still ample chances for addressing other risk factors responsible for mortality from ca lung. To identify such factors, the present paper aims to examine the relationships of death from ca lung with certain sociodemographic variables.

Methods

Data were collected from National Family Health Survey (2015-2016) (NFHS 4), Global Adult Tobacco Survey (GATS) 2: India 2016-2017 and India: Health of the Nation's States, a report by Indian Council of Medical Research (ICMR), Institute for Health Metrics and Evaluation (IHME), and Public Health Foundation of India (PHFI).[6-8] State and /or Union Territories was the unit for analysis. Data on smokeless tobacco (SLT) use, smoking and second hand smoking (SHS) and total tobacco use were taken from GATS 2 report. Mortality rate due to ca lung for different states were taken from India: Health of the Nation's States, a report based on Global Burden of Disease Study. Data on clean fuel were taken from NFHS 4. Electricity, LPG and/or natural gas, biogas were considered as clean fuel. Per capita Net State Domestic Product was considered as parameter for economic condition and expressed in INR (Indian currency). Data on this parameter for 2015-2016 were taken from Ministry of Statistics and Programme Implementation, India.[9] NFHS 4 considered people between 15 and 49 years while GATS 2 interviewed people aged 15 years or older.

The study was an analysis of anonymous datasets. Total 29 states and 1 Union Territory were included for analysis. Spearman correlation coefficient and multivariate regression were used for analysis. P value <0.05 was considered significant. PASW for Windows software (version 19.0; SPSS Inc, Chicago) was used.

Results

Mortality rate was highest in Mizoram, followed by Manipur and Kerala. Interestingly, smoking rate was also highest in Mizoram (34.4%). Similarly, Manipur was third highest among states, in terms of tobacco consumption (55.1%). Mizoram (84.1%) had highest exposure to SHS at home while Jammu and Kashmir (57.5%) recorded highest exposure to SHS at work.

Scatter plots were prepared for depicting the association between death from ca lung and sociodemographic factors. (Figs 1-3) Positive relation of ca lung mortality was noted with smoking and SHS at home and/or work.

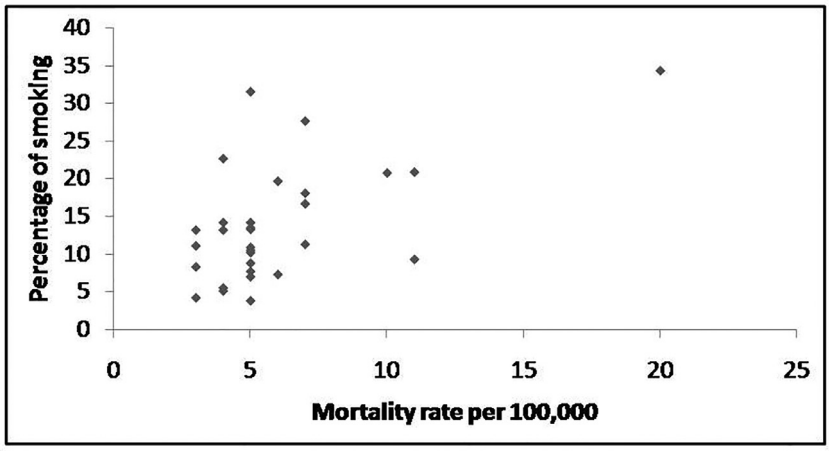

Fig. 1. Smoking and mortality from ca lung in India.

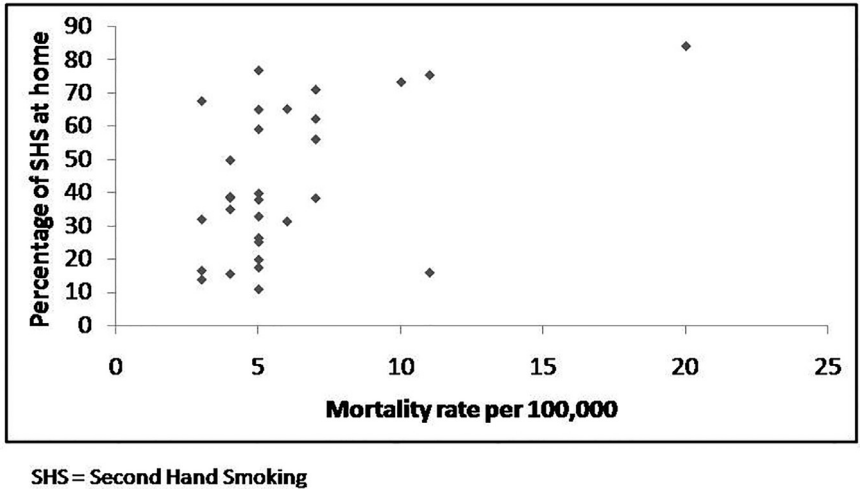

Fig. 2. Second hand smoking at home and mortality from ca lung in India.

There is insignificant correlation noted between tobacco use and ca lung mortality ($r = 0.315$, $P = 0.090$). Similarly, significant correlation was there between smoking and deaths from ca lung ($r = 0.575$, $P = 0.001$). SHS at home and work also share significant correlation with the cancer deaths ($r = 0.476$, $P = 0.008$ and $r = 0.374$, $P = 0.042$, respectively). SLT and alcohol did not seem to have any significant correlation with death from ca lung.

On multivariate regression, only clean fuel was significantly related to deaths from ca lung ($P = 0.021$) (Table 1).

Discussion

The present paper tried to have a national look on mortality from ca lung and associated factors. Mizoram (20/100,000 population), Kerala and Manipur (11/100,000 population for both) recorded highest death rate in the country. Crude lung ca cases were highest in Kerala and Mi-

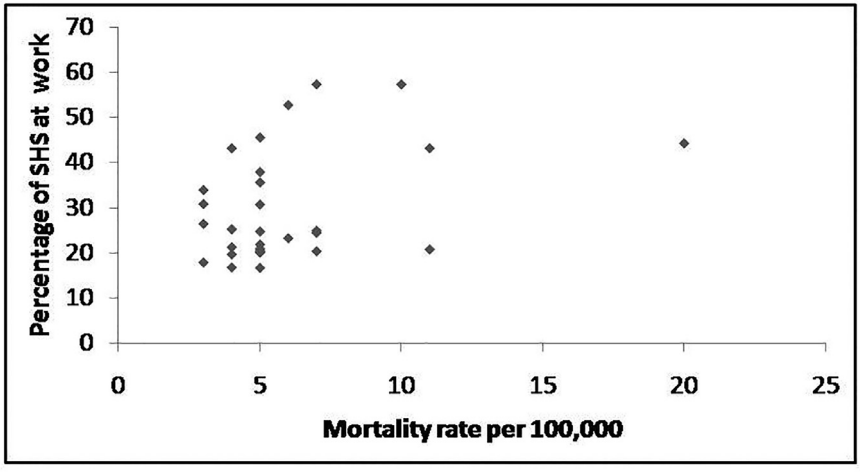

Fig. 3. Second hand smoking at work and mortality from ca lung in India.

Table 1
Multivariate analysis for mortality from ca lung in India.

Variables	B	95.0% confidence interval	*P* value
Smokeless tobacco use	0.049	−0.068 to 0.166	0.396
Smoking	0.216	−0.038 to 0.469	0.091
Alcohol use	−0.076	−0.243 to 0.091	0.354
Per capita NSDP 15-16	−1.492E−5	0.000-0.000	0.303
Clean fuel	0.109	0.018-0.199	0.021
SHS at home	0.013	−0.085 to 0.111	0.787
SHS at work	−0.005	−0.130 to 0.120	0.938

NSDP, Net State Domestic Product; SHS, second hand smoking.

zoram (males) and Mizoram and Manipur (females). Crude DALY rate was highest in Mizoram, Kerala, and Manipur.[3]

Tobacco smoke is a known cause for ca lung. It has a dose response relationship with risk for developing lung cancer.[10] Previous analysis documented that 41.5% DALY due to lung ca could be attributed to smoking.[3] The present analysis found significant correlation between death from ca lung and smoking. From preventive point of view, both smoking and tobacco could be addressed simultaneously. Strong advocacy and frequent public awareness activity may play a crucial role in discouraging people from adopting and/or continuing smoking. By implementing Cigarettes and Other Tobacco Products Act (COTPA) since 2003, India has already registered its dedication to prevent smoking. High taxation and putting pictorial warning on cigarette packets are other ways the country has followed for bringing down the prevalence of smoking and its aftermath. The results are also visible, as evident from tobacco survey, with a 6-point percent reduction in prevalence of tobacco use.[6] To ensure sustained reduction, emphasis should be put on counseling of current smokers and awareness activities.

In fact, smoking is most preventable contributor in deaths from ca lung. Since 80% of the 1.1 billion smokers worldwide live in low- and middle-income countries, prevention of smoking by counseling, banning advertisements and raising tax and offering help to smokers to quit are some recognized measures adopted by WHO.[11] It may be of interest that most of the deaths from ca lung occur between 25 and 69 years of age, that is, they are premature in nature.[12,13] A reduction in mortality would therefore help India to achieve target for Non Communicable

Diseases (NCD) prevention and control in the country.[14] Geographically, all 5 states with highest smoking rates are in north-eastern part of the country. Hence, it is possible to adopt localized approach, appropriate with the prevailing culture, in this particular region.

Increasing incidence among nonsmokers suggests the role of SHS and air pollution in causation of the disease. As highlighted earlier, lifetime nonsmoker has 24% excess risk of developing ca lung from a smoker spouse.[4] SHS was estimated to contribute for 2.3% DALY due to lung ca in the country.[3] The present study again underscores the risk of ca lung in individuals experiencing SHS, either at work or at home. COTPA at times may not be effective, as suggested by a previous study.[15] As only smokers are considered for being at risk of developing ca lung, Information, Education and Communication (IEC) activities should also highlight the role of SHS in developing ca lung.

Although SLT is another problem for India, particularly for states recording >40% adults consuming it like Tripura, Manipur, Odisha, and Assam, the present paper could not find any association of it with mortality from ca lung. Previous analysis also supported the view.[3]

Every year, more than 8 million deaths occur due to tobacco use, out of which 1.2 million nonsmokers die from SHS annually.[11] Adoption of effective tobacco control measures would have a lasting effect on the reduction of lung ca related mortality. Regular monitoring of data on pattern of tobacco use and antitobacco campaign could be 2 strategies for such achievement. Emphasis really needs to be put in north-east part of the country for overall improvement of country parameters. Seven out of 10 states with highest tobacco use are in this part of India.

For reducing the extent of ambient air pollution, the Government of India is committed to scale new heights through its flagship program Pradhan Mantri Ujjwala Yojana.[16] States like Delhi and Goa are performing well, in terms of coverage of clean fuel in the community. Rest of the states need to step up the implementation of the program for reducing mortality from exposure to biomass. Outdoor air pollution has also grabbed attention recently. Stubble burning and vehicular regulation have been targeted for the same. Since 43% DALY due to lung ca could be attributed to air pollution, both indoor and outdoor measures need to be strategically placed to cut down the impact.

Irrespective of smoking status, ca lung seems to be more prevalent among low socioeconomic condition.[5] A cohort study demonstrated the effect of socioeconomic condition on short-term survival after lung cancer. The well-to-do section is thought to be most benefitted from IEC activities meant for ca lung.[17] Manipur and Jammu & Kashmir are 2 examples where high death rate due to ca lung exists with low per capita income. There is need for segregating data on economic basis and to see whether poor people are the common victims of such deaths.

Late presentation and wrong diagnosis are 2 common causes for delayed confirmation of ca lung in India.[18] It was beyond our scope to explore if there was any delay in confirmation and subsequent analysis. Since such delay is common even in developed countries, states having higher mortality rate should look for any such predisposing factor.[19] The future epidemiology could be focused on that.

Strengths of the study include use of national databases for analysis, representation from all states and efforts to put relevant factors into picture from public health angle. Among limitations, ecological nature and lack of information on severity of the disease could be mentioned. Retrieval of data from different sources which used different methodologies might be another setback for the present paper. Inadequate reporting on cause of death is a short coming the data base faced.[3]

To conclude, smoking and SHS are the major associates of mortality from ca lung. Robust implementation of tobacco control measures is the only way forward for protecting people from ca lung and subsequent deaths. Along with COTPA, there is need to have provision for counseling at the primary care level to help smokers quit and strong advocacy for nonsmokers. Substantial data are required for the country whether such mechanisms are available everywhere. Future research may explore the gap and recommend accordingly.

Declaration of Competing Interest

None.

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