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Assessing Lung Disease among Elderly Exposed to Risky Health Behavior

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Abstract
As the population ages, the health of the individuals get affected and the burden of disease increases.In developing countries there is an increase in non-communicable diseases such as heart disease, lung disease, asthma, obesity, diabetes etc.According to WHO sponsored Study of Global AGEing and Adult Health (SAGE 2007) which was implemented in the states of Assam, Karnataka, Rajasthan, Uttar Pradesh, Maharashtra and West Bengal, non-communicable disease like lung disease was found to be prevalent in India among elderly.By analyzing the data of 6560 individuals of 50 years and above age group the objective of this study is to look for factors affecting lung disease and to find out the risk association among tobacco and alcohol users with lung disease.Odds ratio is calculated by using Mantel Haenszal test statistics, where tobacco use is taken as a confounder variable to find out the adjusted odds ratio between lung disease and alcohol.A causal analysis (logistic regression) was done to find out the odds ratio at 95% significance interval to determine the factors affecting lung disease. Mantel Haenszal test statistics shows that there is a relationship between alcohol use and lung disease after controlling the tobacco use.Older persons exposed to consumption of alcohol and tobacco use are at greater risk of developing lung disease;Age, income and physical activity are also an important factor in developing disease, whereas females are less prone in developing lung disease.

Keywords: Lung Disease, Elderly, Smoking and Drinking

Introduction
The process of population ageing is defined as "the decline in the proportion of young population and the rise in older population" and is primarily a function of demographic transition. The age structure of a population is the result of three basic population processes fertility, mortality and migration. When this process is constant for many years, a stable age structure emerges. All societies undergo atransition from condition of high fertility and high mortality to condition of low fertility and low mortality. Low fertility is a necessary condition for the population ageing and mortality decline is a more fundamental determinant of age structure transition and population ageing (Coale, 1964).

In starting of 2000 there were 600 million old people all over the world, this population is continuously growing as there is increase in life expectancy over period. It is projected to be 10.2 million by 2021.United Nations has declared 1999 as the year of older persons. Globally, the number of older persons(aged 60 years or over) is expected to be doubled, from 841 million people in 2013 to more than 2 billion in 2050, (United Nations, 2013).India is no exception to the process of population ageing. The population of India has increased from 361 million in 1951 to1.21 billion in 2011. During this period, the percentage of persons aged 60-plus increased from 5% to 9% and it is projected to grow to 11% in 2025 and 19% by 2050.

As the population ages' the health of individual gets affected and the burden of disease increases with increasing age. In most of the developing countries there is an increase in chronic non communicable diseases such as heart diseases, hypertension, arthritis, obesity etc.According to a report by the World Health Organization (WHO), the deaths due to lung diseases in India were on the rise accounting for 11 per cent of the total deaths. As many as 142.09 in every one lakh, died of one form of lung disease or the other giving India the

dubious distinction of ranking first in lung disease deaths in the world.Recent estimates from India suggest that in 2005 chronic diseases accounted for 53% of all deaths and 44 % of DALYs lost, with chronic respiratory disease accounting for 7% deaths and 3% DALYs lost.

Nicotine is ahighly addictivedrug. Addictionkeeps people smoking even when they wantto quit(US Department of Health and Human Services, 2010). Tobacco use among older Indians is high. The estimated prevalence of tobacco use among older respondents is found to be higher whereas alcohol use among older Indian is low.In India, the estimated numbers of alcohol users in 2005 were 62.5 million, with around 17% of them, which translates into 10.6 million, being dependent users (Ray, *et.al*., 2004). Usually 20–30% of hospital admissions are due to alcohol-related problems(Benegal, 2005). Only about few older respondents reported alcohol consumption, with the substantial majority of these only drinking infrequently. According to SAGE-survey, older Indians are not eating enough fruits and vegetables but are reasonably active; it is notable that about one third of oldest respondents engaged in vigorous or moderate physical activity.

However, newresearch shows that the poisons in cigarettesmoke weaken the tumor fighters. When thishappens, cells keep growing without beingstopped. For this reason, smoking can cause cancerand then block your body from fighting it (US Department of Health and Human Services, 2010). The epidemiological evidence linking smoking to risk of lung disease is extensive. Smoking and alcohol consumption are found to be the major factor associated with lung disease.It has been proved through many epidemiological studies that smoking is the main cause of lung disease, although these associations include both detrimental (at least for moderate drinking) and some potentially beneficial effects. Alcohol intake of three or more drinks per day and cigarette smoking share similar, and probably additive, adverse effects on some forms of cardiovascular diseases,(Mukamal,*et. al*. 2006).

Literature Review

Demographic ageing is an important issue in India. As the aged population is increasing Indian government is coming out with various policies for older persons. Scenario of older population in India, according to the 2011 census, the proportion of population aged 50-plus is 15% where males are 15.5% and females are 16.3%, among the bigger states the proportion of elderly 60-plus varies from 5.9% in Delhi to 12.6% in Kerala.

According to the latest WHO data (2011) there are 11% deaths in India only due to Lung disease which makes India rank 1 in the world, Lung disease is found to be the most common disease worldwide. In India, about 20% of the population has at least one chronic disease and over 10% have more than one (Patel, et. al, 2011). This burden is disproportionally felt by the older population. Heavy alcohol consumption was a risk factor for lung disease among smokers in many studies. Although residual confounding by tobacco smoking cannot be ruled out, this finding may reflect interplay between alcohol and smoking, emphasizing the need for preventive measures (Bagnardi, 2010).

The prevalence of tobacco use in any form is 35% in India.Among them 21% adults use smokeless tobacco 9% smoke and rest 5% smoke as well as use smokeless tobacco. (GATS)-India. According to NFHS-3 (2005-06), the prevalence of tobacco among male is 57.6%. For female it is only 11%, more than half of the men use one or more forms of tobacco, compared to women. Only one percent of women (aged 15-49) smoke cigarettes and bidis, 8% chew pan masala, gutka and other tobacco products. The prevalence is more in rural areas than urban areas. The prevalence of tobacco smoking is an important predictor of the future burden of tobacco related diseases, disability and mortality. (Ezzati and Lopez, 2004; WHO, 2008)

Pattern of alcohol consumption varies with geographical location.The National Household Survey of Alcohol and Drug Abuse found that of the total population 21.4% are currently using alcohol among male adults. The prevalence of alcohol is highest in North east region which is above 65% and lowest in Gujarat around 7%. According to NFHS-3 (2005-06), only 2% of women and 32% of men consume alcohol in India. In a study by Ramachandran *et.al.* on temporal changes associated with pattern of life style (1989–2003) there had been a decline in levels of physical activity. The regular use of motorized vehicles increased from 86.6% to 93.4% whereas the percentage of people watching television regularly increased to 70.1% from the baseline value of 57.2% in 1989. Moreover, fewer subjects were engaged in manual work (22.8% in 2003 vs. 80% in 1989) (Ramachandran *et.al*, 2004).

Need for the study

The percentage of older population is increasing in India so it is essential to know about their health behaviors and health problems associated with their lifestyle.WHO SAGE is one of the surveys which give data on aged population related to their demographic, socio-economic, health problems and quality of life.The need for this study is to find out the causal effect between the chronic lung disease and risky health behaviors and socio-economic and demographic characteristics. What are the factors that these diseases are affecting and is common among older people?

Information about risky health behaviors i.e. tobacco use, usage of alcohol, and preventive health behaviors like physical activity and environment, among older population is less known. To overcome this problem, SAGE data has been used to find out risk association.

Survey on lung disease at national level is rarely available, through SAGE survey the prevalence of these diseases can be obtained and the factors affecting these diseases can be calculated from the available information. Burden of disease is higher among older population so there is problem in activities of daily living/instrumental activities of daily living among them. On the basis of self-reported health very few surveys have taken place. SAGE survey gives information about six domains of health activity, based on these questions state of health can be assessed among older population.

Objectives

- To study the relationship of individual socio-demographic variables on lung disease among elderly.
- To measure the risk magnitude of lung Disease among elderly exposed to smoking and drinking.

Data Source & Methodology

The study of global ageing and adult health (SAGE) is a multi-country study in six countries. SAGE is a

longitudinal health survey, supported by World Health Organization (WHO). The main objective of SAGE was to obtain reliable, valid and comparable data on levels of health across a range of key domains for adult populations. SAGE wave 1 India was implemented in the states of Assam, Karnataka, Rajasthan, Uttar Pradesh, Maharashtra and West Bengal-the same states covered in the World Health Survey India 2003. The same primary sampling units and the sample households covered in the WHS were the baseline sample for SAGE India wave1, which was conducted in 2007.

A systematic simple random sampling selection process was undertaken for WHS that included all states in India. SAGE wave 1 used almost the same sample for selected six States. Rural sampling is done in two stage sampling and three stages sampling in urban areas. The primary sampling units in rural areas were villages while in urban areas the PSU's were city wards. From each city wards, two census enumeration blocks (CEB) were selected. A total of 10,600 households were covered and 9,626 household's interviews were completed covering a population of 57,082. Information on individual health modules were collected from 11,230 individual respondents. Since the analysis is on older population so we have selected 6,560 individuals aged 50-plus.

SAGE India used household, individual and proxy questionnaire. The household questionnaire was administered to any household member aged 18-plus, which gathered information on household roster, income, assets, health and non-health expenditures etc. The individual questionnaire was administered to all adult respondents aged 50-plus. This covered overall health, risk factors, health behavior, health care, quality of life, social connection and participation in the community.

Background characteristics tables are generated for chronic lung disease to show the prevalence of disease under study by demographic and socio-economic characteristics.To find out the risk association among tobacco and alcohol users with lung disease, odds ratio is calculated by using Cochran Mantel Haenszal test statistics, where tobacco use is taken as a confounder variable for lung disease to find out the adjusted odds ratio. Cochran Mantel Haenszal test statistics is used in case control studies (retrospective). Using a cross-sectional data case control study can be performed by treating the diseased persons as cases and exposed persons as controls. Matching is not done, as the cases and controls both are from the same population so they are already matched except the characteristics under study (McDonald, 2009).

$$\chi^2 MH = \frac{\{|\sum[a-(a+b)(a+c)/n]|-0.5\}^2}{\sum(a+b)(a+c)(b+d)(c+d)/(n^3-n^2)}$$

Cell valuesare a, b, c. d.

Total sum of cell values is n= (a+b+c+d).

Hypothesis tests used in Cochran Mantel-Haenszal Analysis.

H_o = There is no relationship between alcohol use and lung disease after controlling the
tobacco use.

H_1 = There is a relationship between alcohol use and lung disease after controlling the
tobacco use.

Under the assumption:

1. Observations are independent from each other.
2. All observations are identically distributed.

A causal analysis (logistic regression) was done to find out the odds ratio at 95% significance interval to determine the factors affecting Lung Disease.For the calculation, we took the disease variable (binary) as a dependent variable with background characteristics such as age, sex, marital status, caste, religion, education, income, and other factors specific to each of the disease under study as physical activity, tobacco and alcohol user as independent variables.

Result

Table-1:

The prevalence of Chronic Lung Disease is decreasing with age, starting from 50-59 age group the prevalence is (3.5%) to 60-69 age group which is (4.5%), 70-79 age group (4.70%) but there is decrease in the prevalence of 80+ age group that is (4.60%).

The prevalence of Chronic Lung Diseaseamong male is (5.50%) which is quite high in comparison to females i.e.(2.60%).Rural residents are found to be affected more by Chronic Lung Disease as the prevalence of disease in urban area is (3.30%) and in rural areas it is almost (4.30%).

Among the older people with increasing education the prevalence of Chronic Lung Disease is 3.70% &4.60% for people who are uneducated and educated up to primary level but there is decrease among secondary education population (4.60%) and (3.10%) for the people who are educated up to college level. Older population with who belong to poorer wealth quintile has highest prevalence of Chronic Lung Disease(5.40%) whereas poor have (3.60%) and the lowest were among richer with 3.10%.

In religion wise comparison,others have prevalence of 3.00% while Muslimhas highestprevalence (4.60%) andHindu(4.00%) respectively.Highest prevalence of Chronic Lung Disease was among never married people (6.30%) and lowest among separated/divorced/widowed i.e. (3.10%).

The logistic regression for lung disease for the background characteristics is shown in table.The odds of having lung disease with advancing age are increasing.Considering 50-59 age group as reference, the odds of having lung disease in 60-69 age group is 1.33 timesmore likely and odds of having lung disease is 2.35 times more likely in 70-79 age group and odds in 80-plus age group is 1.27 times more likely to develop disease.Considering male in reference category the odds of having lung disease is 53% less likely in females. Similarly elderly residing in urban areas are 8% less likely to develop chronic lung disease.

Lung disease is more common among educated people in comparison to illiterate respondents, considering uneducated older people in reference category college educated people are 38%less likely to develop lung disease, whereas the odds of developing disease is 1.15& 1.24times more likely in elderly educated up to primary and secondary. Similarly considering poorer people in reference category there is a decline in risk of developing disease

with increasing income, the odds of having lung diseaseis 37 % less likely in medium class and was found to be statistically significant.

Muslims are having higher risk of having lung disease with reference to other religion. Lung disease is common among married older people, considering never married as reference category the odds of having lung disease is 30% less likely among Separated/ divorced/widowed people and 0.1% less likely to develop among married couples. Older respondents engaged in vigorous physical activity have odds 43% less likely to develop disease with reference to respondents engaged in low physical activity.

Table-2:

Table shows that the odds ratio of the population who are exposed to alcohol use and having lung disease is 1.95 which is significant at (95 %) level of significance.Thus we can say that people that are exposed to alcohol use are 1.95 times more likely to develop lung disease.

Odds of having lung disease to those older people who are exposed to tobacco use is found to be 2.134 which are significant at (95%) level of significance. Thus we can say, those persons who are exposed to tobacco are 2.13 times more likely to develop lung disease.

Cochran Mantel Haenszal test statistics gives the adjusted odds ratio when tobacco is considered as confounder variable or when adjusted for tobacco consumption among older people. Adjusted odds ratio is found to be significant at (95%) level of significance that is 1.526. Thus we can conclude that after controlling for tobacco use the odds of having lung disease to those people who are exposed to alcohol is 1.52 times more likely. According to the adjusted odds ratio and the P-value (significant) we will have to reject the null hypothesis (H_o). There is a relationship between alcohol use and lung disease after controlling the tobacco use.

Findings & Conclusions

Logistic regression shows that females are less prone towards developing chronic lung disease. It is observed that older respondents involved in vigorous activity are at less risk to develop lung disease. Respondents belonging to medium class were found not to develop disease according to analysis. Married elderly are having lesser risk whereas, Widowed/Separated/Divorced are at even lesser risk towards developing lung disease. Physically active elderly are at lesser risk of developing disease.Further, Cochran Mantel-Haenszal Analysis shows that older persons exposed to consumption of alcohol and tobacco use are at greater risk of developing lung disease; it is found that when we control for the variable tobacco use the risk of developing lung disease got lowered. Thus, only alcoholic persons are at lesser risk for developing the disease in study than the persons who are also exposed to both, tobacco use and alcohol consumption.

Appendix

Table 1: Percentage distribution and Odds Ratio of self-reported Lung Disease by background characteristics

		chronic lung disease	
Characteristics	**Categories**	**Prevalence**	**Odds Ratio (95% C.I.)**
Age	50-59	3.5%	
	60-69	4.5%	1.33 (0.90, 1.96)
	70-79	4.7%	2.35 (1.22, 4.5)***
	80+	4.6%	1.27 (0.59, 2.70) **
Sex	Male	5.5%	
	Female	2.6%	0.47 (0.31, 0.69)***
Place of Residence	rural	4.3%	
	urban'	3.3%	0.92 (0.52, 1.60)
Education	uneducated	3.7%	
	primary	4.6%	1.15 (0.76, 1.74)
	secondary	4.6%	1.24 (0.79, 1.96)
	college	3.1%	0.62 (0.27, 1.44)
Wealth Quintile	poorer	5.4%	
	poor	3.6%	0.89 (0.56, 1.43)
	medium	3.4%	0.63 (0.38, 1.03)**
	rich	3.9%	1.23 (0.63, 2.36)
	richer	3.1%	0.59 (0.28, 1.24)
Religion	others	3.0%	
	Hindu	4.0%	0.77 (0.22, 2.65)
	Muslim	4.6%	0.85 (0.22, 3.20)
Marital status	never married	6.3%	
	married	4.4%	0.99 (0.28, 3.50)
	separated/divorced/widowed	3.1%	0.70 (0.18, 2.64)
Physical Activity	low	5.8%	
	moderate	3.3%	0.80 (0.51, 1.25)**
	vigorous	3.8%	0.57 (0.27, 1.16)*

® Reference category, ***P<0.1, **P<0.05 and *P<0.01

Table-2: Cochran Mantel Haenszal test statistics

Alcohol use * lung disease			
	lung disease		Total
	yes	No	

alcohol use	yes	70	969	1039
	no	197	5324	5521
Total		267	6293	6560

O.R=1.952, P<0.000 C.I. (1.47, 2.59)

Tobacco use * lung disease				
		lung disease		Total
		yes	No	
Use of tobacco	Yes	186	3262	3448
	No	81	3031	3112
Total		267	6293	6560

O.R. =2.134 P<0.000 C.I. (1.63, 2.78)

Alcohol use * lung disease * Tobacco use					
Tobacco use			lung disease		Total
			yes	no	
Yes	Alcohol	yes	67	861	928
		no	119	2401	2520
	Total		186	3262	3448
No	Alcohol	yes	3	108	111
		no	78	2923	3001
	Total		81	3031	3112
Total	Alcohol	yes	70	969	1039
		no	197	5324	5521
	Total		267	6293	6560

$O.R_{adjusted}$= 1.52 P<0.005
C.I. 95% (1.474, 2.586)

Null hypothesis is rejected as p-value is less than 0.05 i.e. there is a relationship between alcohol use and lung disease after controlling for tobacco use.

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