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A REVIEW OF THE INFLUENCE OF URBAN AIR POLLUTION ON LUNG HEALTH, SPECIFICALLY CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN KOLKATA

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Abstract:

At present air pollution is a serious problem for human beings. The ambient air pollution creates so many health hazards on human body. Indoor and outdoor pollutants specially suspended particulates matter (SPM) is associated with the development of chronic obstructive pulmonary disease (COPD). The findings that link acute increases in urban air pollution to the short-term effects on people with chronic obstructive pulmonary disease (COPD) are consistent. Beyond the immediate consequences, a pertinent public health and scientific topic is how much long-term exposure to air pollution contributes to deteriorated lung function and the onset of COPD. The few cross-sectional studies found that the more polluted locations had higher rates of self-reported chronic bronchitis and emphysema diagnoses, as well as worse lung function levels. Air pollution is usually concentrated in densely populated metropolitan areas, especially in developing countries where environmental regulations are relatively lax or nonexistent. This paper presents a review of influence of urban air pollution on lung health especially chronic obstructive pulmonary disease (COPD) in Kolkata.

Keywords: Air Pollution, Suspended Particulates Matter (SPM), Chronic Obstructive Pulmonary Disease (COPD), Pollutants.

Introduction:

Air Pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm and discomfort to humans and other living organisms, or damages the natural environment, into the atmosphere. According to the World Health Organization, 2.4 million people die each year from causes directly attributable to air pollution. Epidemiological studies further suggest that more than 500,000 Americans die each year from cardiopulmonary disease linked to breathing fine particle air pollution arising from indoor air pollution.

Human health is seriously impacted by air pollution. Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease is characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. In dirty air when we breathe, all air pollutants deep into our lungs. A COPD diagnosis is confirmed by a simple test called spirometry, which measures how deeply a person can breathe and how fast air can move into and out of the lungs. So it's a common matter that causes a serious damage of respiratory system due to air pollution and is a major cause of morbidity and mortality throughout world.

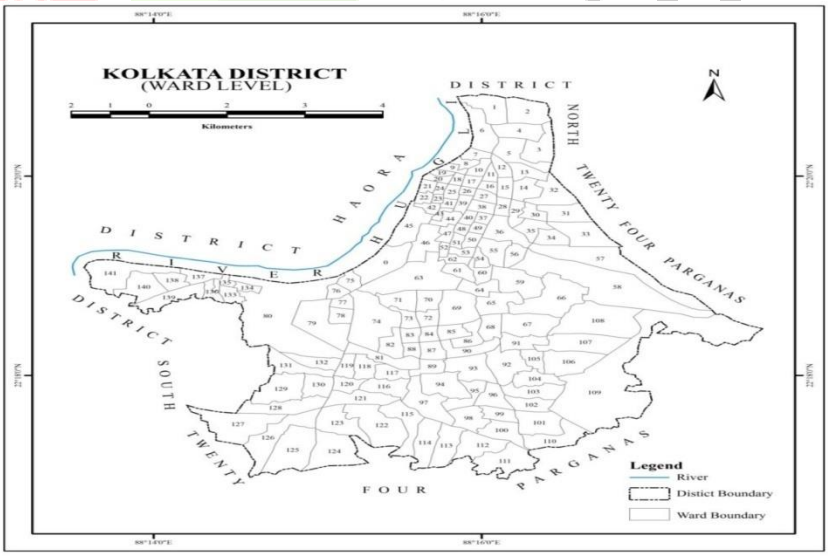
Although, tobacco smoking is the most commonly risk factor for chronic obstructive pulmonary disease (COPD). But a recent study had shown that factors such as airway hyper responsiveness, a family history of asthma and respiratory infection in childhood are important determinants of COPD. So causes of COPD are,-

- Tobacco smoke- including cigarette, pipe, cigar and other types of tobacco.
- Indoor air pollution- mainly biomass fuel smoke.
- Outdoor air pollution- ultra fine particulate matter by vehicles, others inhale particles
- Occupational dust and chemicals- vapours, irritants, fumes and etc.

Even non-smoker, second hand smoke is also associated with chronic obstructive pulmonary disease (COPD).

Study Area:

The highly populated city, Kolkata (under Kolkata Municipal Corporation having 141 wards distributed under 15 boroughs) has been selected as the study area. The city has an area of 187.33 sq. kms. extends latitudinally from 22^0 45`N to $22^0$65`N and longitudinally from $88^0$25`E to $88^0$45`E. Kolkata is bounded by Haora District in the north and west, by North 24 Parganas District in the northeast and east and by the South 24 Parganas district in the southeast and south. As of 2011Census, Kolkata city had a population of 44, 96,694 and the urban agglomeration had a population of 13,216,546.



Data base and Methodology:

The present study is based on secondary data sources which have been collected from Indian Council of Medical Research (ICMR), Chittaranjan National Cancer Institute (CNCI), District statistical handbook, different literature reviews, books and journals. Besides using the data sets for various statistical analysis and diagrams have been prepared using Microsoft Excel programme.

Limitation of the study

Due to absence of such data sets the present study only highlights lung disease especially chronic obstructive pulmonary disease (COPD) and lung cancer of the district. Lack of systematic data the present study cannot show the details about the disease of the district due to air pollution.

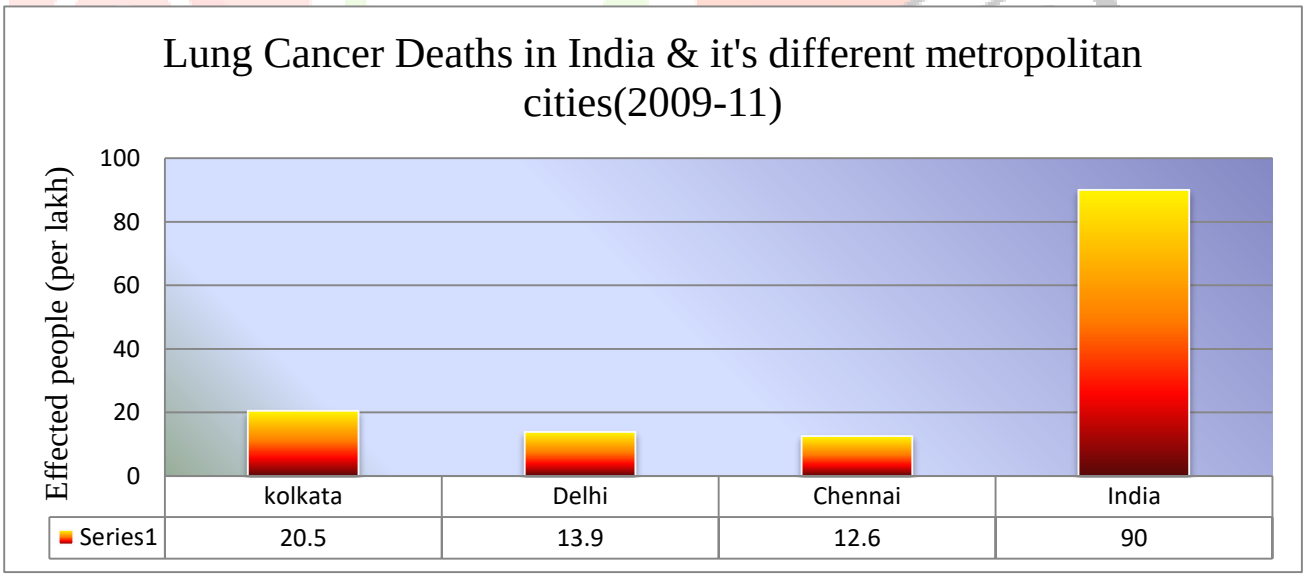
Particulate matter and COPD:

According to Centre for Science and Environment (CSE) study has shown that Kolkata's breathes in more poison than Delhi air, especially near high-density traffic or vehicular in terms of its area. Among the pollutants, ultra-fine particulate matter (PM2.5) is the most potent pollutant as it can reach the deepest crevices of the lungs. American Heart Association (AHA) 2004 initial statement on air pollution there exists a strong evidence for fine particulate matter (PM2.5) having a causal relationship to cardiovascular disease. There are several ways by which PM2.5 could affect the cardiovascular system. One leading explanation suggests that several components of PM2.5, once inhaled, can cause inflammation and irritate nerves in the lungs.

Except monsoon season, all through the year the high level of PM2.5 is a major killer. Critical pollution time is mainly November to February in Kolkata. Experts also find out that between November and January when COPD induced deaths rise due to worst air quality.

COPD and Lung Cancer in Kolkata:-

Almost 61% rise particulate matter (PM2.5) from 2010 to 2013 in Kolkata's air due to increasing the number of registered various types automobile. As a result around 70% of Kolkata's inhabitants are suffering from some kind of respiratory problems and also COPD. As per report of World Health Organisation (WHO), 2.4 million people die each year from causes directly attributable to the air pollution. Apart from smoker and old persons, non-smoker young men and women, children especially school going children are bearing the disease chronic obstructive pulmonary disease (COPD).



Source: Indian Council of Medical Research (ICMR)

Recently Kolkata's SPM level around 211 ug/m3, where the safe or standard limit 140ug/m3 and RPM level 105ug/m3, much higher than safelimit of 60ug/m3 of residential area.

The study of the Indian Council of Medical Research (ICMR), 2009 and 2011 programme which showed that Kolkata has the highest number of new lung cancer cases and the value is 20.5 per every lakh people where Delhi (13.9) and Chennai (12.6) stands behind Kolkata. Even the study shows 90 deaths per lakh people due to ultra-fine particulate matter (PM2.5) in India.

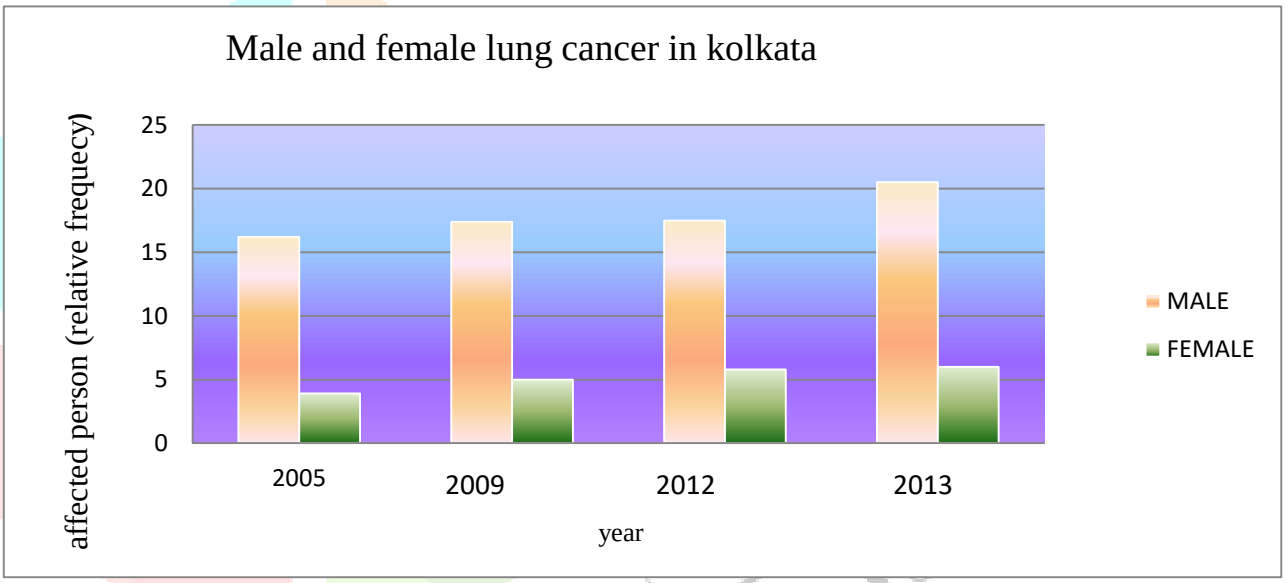
According to Jaydip Biswaas, director of Chittaranjan National Cancer Institute (CNCI), said "pollution is the major factor behind the sharp increase in lung cancer in Calcutta. There has hardly been any change in other factors like smoking". A report published by CNCI, it shows that relative frequency (%) of lung cancer rising between both male and female from 2005 to 2013.

Table: Lung Cancer in Kolkata (relative frequency in percentage)

YEAR	MALE	FEMALE
2005	16.2	3.9
2009	17.4	5
2012	17.5	5.8
2013	20.5	6

Source: Chittaranjan National Cancer Institute (CNCI)

From this table (No.-1) it's clear that number of lung cancer patients by air pollution (mainly automobile), increasing day by day, even including non-smoker women and men. Before 2005 old age group 50-79 years are mostly affected by the lung cancer normally. But after 2005 strangely the age group of 30-39 years enter in this disease problem by the rise of air pollution as per report of CNCI.



Source: Chittaranjan National Cancer Institute (CNCI)

Oncologist Gautam Mukhopadhyay said "we are now getting lung cancer cases among homemakers with no history of tobacco use in any form". On the other hand CNCI studies have found more than 60% children in Kolkata suffer from chronic obstructive pulmonary disease (COPD) or lung problems. So it's a typical situation to breathe air of the residents of Kolkata. In the general population of the metropolitan city, daily mortality rate increases due to respiratory problems and patients with chronic obstructive pulmonary disease. As per Kolkata Metropolitan Corporation (KMC) records, in everyday in the city's main two crematoria which is Keoratala and Nimtola, recorded 170-180 deaths. But, almost of them 60% deaths for chronic obstructive pulmonary disease (COPD).

Another cross sectional study by Manas Ranjan Ray and Twisha Lahiri (department of Experimental Haematology, CNCI and nature, Environment and wildlife Society) with total 932 non-smoking adults, average age 44years and also inhabitants of kolkata's more or less 10 years. Among them,-

- Traffic policeman (56)
- Road side or street hawkers (188)
- Auto rickshaw drivers (82)
- Drivers of diesel-fuelled buses (78)
- Motor mechanic workers (56)
- Office Jobbers (470)

All the participants, faced various types of problems such as lung function, chronic obstructive pulmonary disease, hypertension and others respiratory disorder by vehicular pollution of Kolkata as per report.

Natural protection system to keep out pollutants:

When pollutants are stuck in the lung, they cause inflammation that can lead to asthma and chronic obstructive pulmonary disease (COPD). Irritations in the cells and finally, these cells mutate and could turn malignant, if pollutants stay in the lungs for years. Some natural protection processes to keep pollutants out of the respiratory system in the human body, such as nasal hair, mucus and macrophage, a type of white blood cell, digests cellular debris and microbes. But this natural protection processes fail, if the pollution level is very high. So air pollution (dust, smoke, smog, etc) is an established trigger of chronic obstructive pulmonary disease (COPD).

Conclusion:

In conclusion, more than 1.2 million motor vehicles playing a vital role to pollute air of the city. Especially particulate matter (PM 2.5) level increasing is more threatening for the inhabitants (smoker and non-smoker) by automobile pollution, as a result of chronic obstructive pulmonary disease (COPD), others lung function problems rising. This study has demonstrated that long-term exposure to Kolkata's air pollution, which is mostly caused by the exhaust of the more than 1.2 million motor vehicles that are registered there, has a negative impact on the health of its inhabitants. It affects lung function, raises the risk of fatal COPD, triggers pulmonary and systemic inflammation, results in covert pulmonary hemorrhage, changes immunity, raising the risk of hypertension and related cardiovascular diseases, damaging DNA and chromosomes, affecting with DNA damage repair mechanisms, and promoting dysplasia of airway cells, raising the risk of lung and respiratory cancer.

It is very necessary to improvement of ambient air quality and decreasing indoor biomass combustion for reduces these types of health problem.

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