Indian Journal of Agriculture and Allied Sciences
A Refereed Research Journal

ISSN 2395-1109
e-ISSN 2455-9709
Volume: 4, No.: 2, Year: 2018

www.ijaas.org.in
Received: 15.06.2018, Accepted: 23.06.2018
Publication Date: 30th June 2018

ENVIRONMENTAL RISK FACTOR LINKED TO THE GENESIS OF LUNG CANCER–A REVIEW

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Abstract: *Cancer is second leading cause of death worldwide and lung Cancer is a most common type of cancer. Many environmental risk factor like Cigarette or Beedi smoking, air pollution , presence of arsenic in Water and soil, radon gas, asbestos, use of insecticides or Pesticides, diesel exposure are linked to genesis of Lung Cancer. During past few years over exposure of these lead to increase in the incidence of Lung Cancer.*
Keywords:*, cigarette / beedi, air pollution, radon, asbestos, arsenic, insecticides / pesticides, diesel exposure.*

Introduction: Now a day, cancer is the second leading cause of death. Lung cancer is most common cancer throughout the world and is responsible for 1.38 million deaths annually [1]. Uncontrolled cell growth in tissue of the lung causes lung cancer. The lung cancer are of mainly two type, one is small cell lung cancer (SCLC) and second is non small cell lung cancer (NSCLC). In the present review, authors try to focus on how environment linked to the genesis of lung cancer. The most common cause of lung cancer is tobacco, Smoke [2]. Due to use of tobacco worldwide 5 million death happening every year with 2.41 million being attributed to developing countries [3, 4]. Not only use of tobacco is responsible for lung cancer, environmental risk factors also including for lung cancer. According to the death due to lung cancer is projected to risk to 10 Million by 2030 with 7 out of 10 death in the developing world [3]. According to ICMR (Indian council of medical Research), the lung cancer data between 24 years (1982 to 2005) has found that while new cases of lung cancer per one lakh male population has increased by around 160% in Chennai, 100% in Banglore, 40%in Delhi and 60% in Mumbai [5]. Worldwide 80% of lung cancer is causes due to smoking [6]. In India about greater of cigrrate or beedi smokers would be killed by tobacco at the age of 25-69 years, losing 20years of life expectancy [3,7] behind smoking different studies proposed many genetic, environmental, hormonal and viral are the risk factors for lung cancer among non–smokers.

On the other hand, a vast relationship between environment and lung cancer in non-smoker such as environmental tobacco smoke / passive smoke [8] US Department of Health and Human Services (2006), randon [9], asbestos [10] and air pollution such as cooking oil fumes [11] and coal burning [12], passive smoking [13]. Distribution of lung cancer in India, sex distribution of smokers in India–male is 33.4% and female is 1.4% (https://docs.google.com). Smoking prevalence is varied in rural area about 31.3%and urban area about 21.5% (https://docs.google.com); [14] Each year 250,000 to 300,000 number of lung cancer patient being detected in India [15]. The developing risk of lung cancer in beedi smoke is 2.64%, cigarette smoker is 2.23%and over all is 2.45% detected [16]. So, India has been labelled as hub for lung cancer due to use of tobacco products [17] and environmental risk factor.

Risk Factors for Lungs Cancer

1. Smoking factor

2. Genetic factors
3. Environmental risk factors

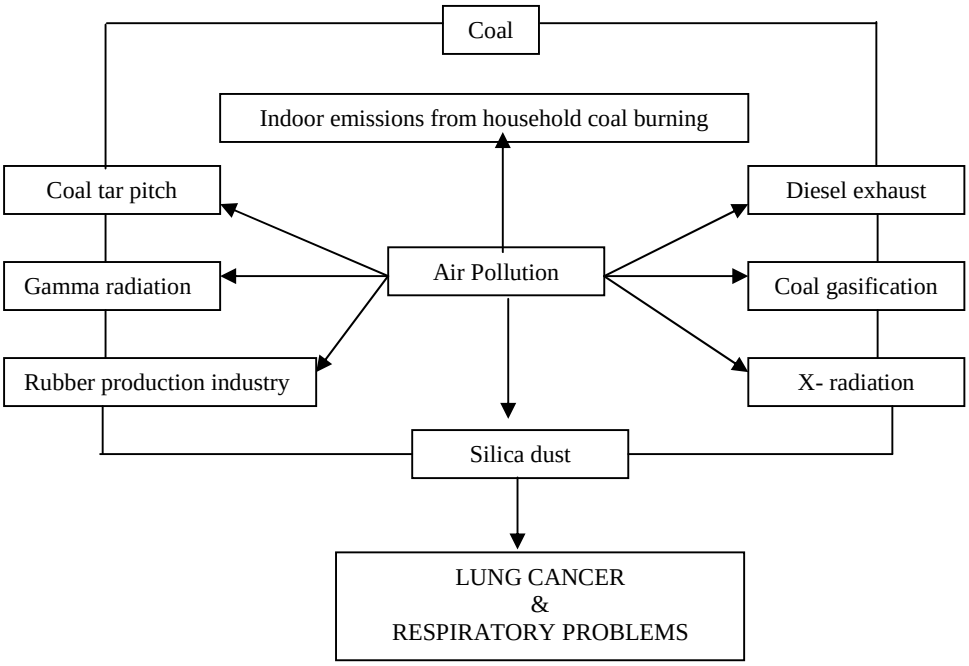
1. Smoking Factors: Cigarette, beedi, cigar, pipe smoking is main contributor of lung cancer [18]. 60 known carcinogen [19] including radio isotopes from the randon decay sequence, nitrosamine and denzopyrene contains in cigarette or beedi. 90% of lung cancer death in men and 70% in woman during the year 2000, worldwide [20], Smoking may be including active smoking and passive smoking. Active smoking is related to cigarette or beedi smoker and passive smoking is inhalation of smoke through environment.

2. Genetic Factor: Family history of lung cancer is a risk factor for lung cancer. It may be increase the risk of lung cancer 2.4 times. This may be due to genetic polymorphism [21]. The following genetic damage of DNA causes cancer, it affects the normal function of cell, including cell proliferation, apoptosis and D N A rapair. As much more damage accumulates the risk of cancer increases [22].

3. Environmental Risk Factor: About 10-15% of lungs cancer causes due to environmental risk factors. Their have been variety in environmental risk such as factors. Air pollution, passive smoke (second hand smoke), workplace exposure, arsenic, asbestos, randon gas, coal gas, coke production , diesel exhaust , rubber production industry , x-radiation etc.

Passive Smoke or Second Hand Smoke: Passive or second hand smoke is a smoking type that comes from burning cigarette or beedi or other tobacco products. Passive smoke is the big cause of lungs cancer in non–smokers of secondhand smoking suggest that, passive smoking is more dangerous than direct–smoke [23]. In the USA due to passive smoking about 3400deths from lung cancer each year [24]. Thus who live with smokers have increase the risk of lung cancer 20-30% while those who work in an environment with second hand smoke have increase 16-19% risk of lung cancer [23]. Investigation of the US [25] and [24], crop [26] UK [27] and Australia [28] have consistently show a significantly increased risk among those smoke to side stream /passive secondhand smoke [29]. Those who live with someone who smokes have a 20-30% increase in risk while those who work in an environment with second hand smoke have a 16-19% increase in risk [6].

Air Pollution: Air pollution is the important factor for the genesis of lung cancer .The presence of polluted air of known human carcinogens such as benzpyrene [30] and second pronounced urban /rural gradients of mortality [31]. According to stocks [32] and [33], benzpyrene in the air was an important factor in the development of lung cancer traffic exhaust fumes released fine particulate (PM 2.5) and sulphate aerosols, which slightly increased the risk of lung cancer [34] and [35] 1-2% of lung cancer is estimated to out door air pollution [34]. Increment of NO_2 increases the risk of lung cancer by 14% [36].



The risk of lung cancer trough air pollution is far less than the risk caused by smoking. From different studies[37]. This facts comes in light air pollution might play an

important role in lung cancer morality, it has been differences between countries after confounding factors such as smoking , social class and population density had been taken into account. Indian women might be affered through indoor air pollution, from different studies it has been looking that the risk of lung cancer is higher in urban area in comparison to rural area [38]. From the studies of US, Asia and Europe have been shown that air pollution from traffic and the combustion of coal, diesel fuel and wood has a modest association with lung cancer risk [38]. From the study of US (2009), it was observed that 5% of lung cancer in male and 3% lung cancer in female between 1970 to 1994 were related to air pollution [38]. From the study of urban air pollution in Europe suggest that the risk may be higher with up to 10.7 % of lung cancer cases in relation to exposure to air pollution.

According to 70% of Kolkata's citizens suffers from respiratory disease [39]. Delhi is not for behind at 68% reports a new study on air pollution by the Chittaranjan National Cancer Institute, West Bangal Department of environment and central pollution board, Delhi ®kolkata has highest number of lung cancer people in the world. This is because it is one of the most polluted city in the world [39]. He conclude that the biomass fuel exposure is an important risk of lung cancer among women in addition of exposure to tobacco smoke [40].

Arsenic: Arsenic is a chemical substance that naturally found on earth in very little amount it may be found in organic and inorganic form. Because it is found in very little on earth that's why its inorganic form is very dangerous for health purpose. Inorganic arsenic have various health effects such as irritation of stomach and intestine, decreased production of RBC and WBC, skin changes and lung irritation. The significant amount of inorganic arsenic increases the changes of cancer–Such as skin cancer, lung cancer, liver cancer and lymphatic cancer [41]. Occupational exposure of arsenic via inhalation caused lung cancer [42]. The main occupational exposure of arsenic occurs mostly in that type of worked who are engaged in smelting and refining copper, gold and lead ores; in producing agricultural pesticides; In using arsenic in pigments and dyes and in manufacturing glass; semiconductor and various pharmaceutical substances from which there may be high exposure to airborne arsenic [43] According to different studies of Taiwan, the surprising evidence to different studies of Taiwan, the suprising evidence comes in light, that ingestion of inorganic arsenic also increases mortality from cancer originating in various internal sites, including lung [43, 44, 45, 46, 47, 48, 49, 50].

The arsenic in water comes from arsenic rich ground strata or in water contaminated by industrial or agrochemical waste [51]. The water and soil is contaminated with arsenic due to higher uses of arsenical pesticides [52]. The chronic poisoning of arsenic contaminated drinking water were 1st reported in 1961 by [53] in Taiwan, followed[54] at chile [55] in India highest toxicity level occurs in inorganic form of arsenic [56].

While organic arsenic are less toxic. The arsenic exposure may comes from natural sources Industrial sources or, administered i.e. accidental sources such accidental sources are arsenic containing insecticide, herbicide or rodenticide. The axposure of arsenic through drinking water, air food and beverage has been reported occurring on many places throughout world. The arsenic exposure in drinking water occurring due to over industrial operation or over withdrawal of ground water for irrigation. The gastrointestinal tract and lung to blood stream is well absorbed mostly ingested of in halaled arsenic [57]. The chronic manifestation such as skin, lungs, liver and blood system, this was 1st diagnosed in West Bengal and Bangladesh patent of Khulna in dec.,1984 [58, 59] by Prof . K.C Sahan July 1982 at School of Tropical Medicine, Calcutta [58]. Through the activation of an oncogenic virus like HPV arsenic cause cancer in human [60]. So arsenic is most important factor liked to the genesis of lung cancer. That's why, through this review, authors try to point out drinking water , food etc environmental sources must prohibited from contamination of inorganic arsenic.

Radon Gas: radon is a radio active substance , that naturally present in environment. Random is formed of breakdown of uranium and found in earth's crust. It is a colourless or odourless gas. It is the second leading cause of lung cancer among non- smokers in USA [61]. The risk of lung cancer increases 8-16% for every $100B_q$ /m^3increase in randon concentration [62]. There is no little radon outdoor that it is not likely to be dangerous but it is more concentrated outdoors. It inters the lung, when it is breathed in, exposed them in very small amount of radiation. That may increase the risk of lung cancer. The level of Radon gas may vary by locality and underlying composition of soil and rocks for example, in areas such as

cornwall in the UK(which has granite as substrate), randon gas is a major problem and building have to be force–ventilated with fans to lower radon gas concentrations The United States Environmental Protection Agency (EPA) estimates one in 15 homes in the US has radon levels above the recommended guideline of 4 picocuries / liter (pci/l)(148bq/m^3) [63]. Studies in United States of some parts, house built on soil with natural uranium deposits can have high indoor randon levels (especially in basements) [63]. In these areas risk of lung cancer is higher those who have lived from many years in a radon–contaminated house. The connection of radon gas with lung cancer was 1st recognized among miners in the one mountains near schneeberg, Saxony. Silver has been mined there since 1470 and these mines are rich in uranium, with its accompanying radium and radon gas [64]. These miners developed a disproportionate amount of lung disease, eventually recognized as lung cancer in the 1870_s [65]. Due to the USSR'S demand for uranium, despite this discovery, mining continued into the 1950_s [64]. The conformation of radon exposure causas lung cancer in the 1960's [66].

Asbestos: Asbestos exposure is an important risk factor for lung cancer. People who work with asbestos such as some mines, mills, textiles plants, places where insulation is used, shipyards & etc are several times more likely to die lung cancer. It is not quite clear that, what–extent high low term or high term exposure to asbestos might raise lung cancer risk. In workers who exposed asbestos and also smoke the risk of lung cancer is much greater. Asbestos exposure in both smoker and non – smokers have a greater risk of lung cancer. Tobacco smoking and asbestos exposure have synergistic effect on the formation of lung cancer [67]. Asbestos exposer can also cause cancer of the pleura called mesothelioma which is different from cancer [68]. In recent years, government prohibited the use of asbestos in commercial and industrial products.

Insecticides/Pesticides: In India farmers mostly end up with lung cancer, because they rely heavily on the use of chemical pesticides to get rid of their pest problems. In developing countries, farmers use 85% of the 2.6 million metric tons of active ingredient of pesticides produce annually in crop production [69]. Pesticides plays a crucial role in development of different type of cancer but its exact mechanism were not found. Higher uses of pesticides and synthetic fertilizers are need of today modern farming, that exposing harmful chemicals in the environment. According to 1992 report of WHO, roughly 3 millions pesticides poisoning occurring annually and 220000 deaths world wide .In developed countries approximately 80% of pesticides produced annually in world. In these countries, less than half of all of all pesticides–induced death and some of them end us cancer death [70]. In developing countries, a higher proportion of pesticide poisonings and deaths occurring today where there are inadequate occupational safety standard and insufficient enforcement; poor labeling of pesticides, illiteracy and insufficient knowledge of pesticide hazards [70]. Through the world uses of pesticide are highest in farm workers and people who live adjacent to heavily treated agricultural farms because farm workers and farmers directly handle 70- 80% of the pesticides they are at greater risk due to pesticides exposure [71]. The epidemiological evidence of US and Europe suggests the cancer incidence among farm worker and farmers are higher among than non form worker [72]. There is a strong evidence, in these high risk populations, the association between lymphomas, soft–tissue sarcomas and certain herbicides [73] as well as between lung cancer due to exposure to organo chlorine insecticides [74]. According to International Association for Research on Cancer (IIARC) evaluated OC insecticides (DDT, chlordane, heptachlor, toxaphene) as being either carcinogenic to humans or not classifiable as carcinogenic caldrcn, dieldrin, lindane) systematic information on occupational risk for lung cancer patients is rarely available in India, four examined studies the association between lung cancer and pesticide exposure [74, 75, 76, 77]. Medical fraternity is fully aware to this dangerous thing, that's why the aim of authors for this review to identify the additional risk in lung cancer, which could form an important part of epidemiological data and it is correlating with environmental exposure to carcinogens. India is a country of farmers, that's why pesticides are highly uses by farmer for crop production and smoking is their joy and pleasure hence these parameters play an important role in determining the important role of additional risk factors in lung cancer more so because, the potential to detect lung cancer early and save lives is being resvisited [69].

Diesel Exposure: over exposure of diesel emission is one of the most important cause of different types of disease including lung cancer.

According to the review of the royal college as physicians noted that the increase in the use of diesel fuel in Britain followed , rather than preceded the striking rise in lung cancer mortality [78] According to US, it is noted that the lung cancer [79] rates are high among transportation workers exposed to the gasoline and diesel exhaust petroleum lubricants and dust from asphate road among finish railroad workers, higher malignant disease rates occurred in engineers as compared with trainman or clerks [80]. From different studies of diesel emissions exposure, it has been specific relationship between lung cancer and diesel emissions. From the study of oat or small cell lung cancer is more likely to result from occupational exposure than from smoking [81] used the Massachusetts Tumor Registry to compare the frequency as various occupations in 100 cases of oat cell lung cancer with that found in an equal number of cases of cancer as central nervous system. Overall this study provides little for an occasion of oat-cell lung cancer with transportation work, let alone with diesel commission exposure .From some recent studies it has been suggested that diesel exposure may cause a small increase in lung cancer risk.

Other Causes: Numerous different–other substance occupational and environmental exposure linked to the genesis of lung cancer. According to (http://monographs.iarc.fr/ENG/ classification /Table4.paf), the list of classification by cancer sites, the Internal Agency for Research on Lung cancer (IARC) states there is ‘’Sufficient evidence’’ to show the following are carcinogenic in lung:

- Methyl ether
- Bis ether
- Cadmium
- Chromium
- Aluminum
- Coal Burning
- Coke production
- Gama radiation

Conclusion: In to day’s time, lung cancer in non-smokers is most important portion of all lung cancer worldwide and we should know to understand the relationship between environment and human health. Specially, conspiration of specially, consideration of the relationship between lung cancer cases and environmental factor is important in order to better manage cancer combating strategies and determining the cause of cancer. Therefore, the environmental risk factor is most important cause of lung cancer in non-smoker, that’s why we should don’t try to playing with nature, we should try or save our nature in the way of saving human life.

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