THE EFFECTS OF AIR POLLUTION ON LUNG CANCER IN NON-SMOKERS: A SYSTEMATIC LITERATURE REVIEW

RAMESHA JAVED[1], DR HEENA KHAN[1]

[1]Physician Associate Studies, School of Clinical and Biomedical sciences, University of Bolton

BACKGROUND

Lung cancer is the leading cause of cancer death, responsible for approximately 1.8 million deaths per year and is the third most diagnosed cancer worldwide. The World Health Organisation estimates air pollution as the thirteenth most common cause of lung cancer mortality, contributing to an estimated 800,000 deaths per year (1)

As the overall rates of lung cancer and smoking are decreasing, clinical interest for lung cancer in non-smokers has started to arise. Industrialisation of countries has increased the emission of harmful environmental air pollutants and decreased overall air quality (2)

- Air pollution accounts for approximately 40% of lung cancer cases in the non-smoking population (3)
- 2% of males and 21% of females diagnosed with lung cancer in Europe are non-smokers and 11% of males and 83% of females in South Asia are non-smokers (4)

AIMS & METHODS

To further comprehend the understanding of the role of air pollution in lung cancer development, the relationship between daily activities, exposure levels and social demographics in non-smokers needs to be explored on a worldwide basis to definitively find out whether there is a link between countries, cities and rural areas.

Aim: to identify the effects of air pollution on lung cancer diagnosis in non-smokers by comparing different types of air pollution.

The literature design consists of previously published research. Medline and PubMed were selected as the search engines. MeSH terms were used for the literature search and Boolean operators were applied.

During initial screening, 6,542 records were identified. Once reviewed, the 15 most relevant studies were selected for analysis.

- Research conducted worldwide was included
- Research studies which had informed consent from participants were included
- Journal articles chosen were not dependent on a particular age, gender, ethnicity or sample size

The quality of the literature was critically appraised using a Critical Appraisal Skills Programme. This ensured a selection of focused literature to reliably support or refute claims with high quality evidence.

RESULTS

Air pollution

- The association between particulate matter and lung cancer in non-smokers was investigated (5)
- Over 50% of the patients diagnosed with lung cancer were non-smokers (5)
- 60% of patients with lung cancer who had never smoked had stage four cancer (5)

Second-hand smoke

- The relationship between second-hand smoke and lung cancer diagnosis was explored (6)
- After a thirteen year follow up, 109 cases of lung cancer were confirmed (6)
- 83.7% were adenocarcinomas (6)
- Combined exposure from the partner and workplace resulted in a greater risk (6)

Agriculture

- The common recurring patterns of lung cancer were investigated over 18 years (7)
- 70% of the non-smokers with lung cancer were diagnosed with adenocarcinoma (7)
- The majority were occupied with agriculture and livestock breeding (7)

Cooking

- The effects of indoor pollution on lung cancer were explored (8)
- Individuals in single-story houses had a 67% greater risk of lung cancer (8)
- Not having a separate kitchen was also associated with an increased risk (8)
- Individuals who cooked regularly were more prone to developing lung cancer (8)

Fuel and coal

- The relationship between household air pollution and lung cancer was explored (9)
- Data from three studies was analysed (9)
- All three studies showed the use of solid fuels to increase the risk of lung cancer by 20% and the use of coal increased the risk of lung cancer by 30% (9)

CONCLUSION

This research has highlighted the significant effects of air pollution on lung cancer in non-smokers. The core findings which support this conclusion are:

- Lung cancer cases in non-smokers have been rising over the years
- Air pollution contains carcinogenic compounds which can cause oxidative damage and lead to lung cancer in non-smokers (10)
- Reducing indoor air pollution and using personal protective equipment is essential (10)

Air pollution has a great impact on public health. Future lung cancer prevention strategies should:

1. Focus on a national policy to reduce air pollution
2. Consider specific measures at the individual level
3. Manufacture devices to prevent exposure to air pollution

FUTURE DIRECTION

This novel research has provided a solid foundation for future studies on the effects of air pollution on lung cancer in non-smokers. To further the study, the following should be adapted:

- Investigate potential determinants of the susceptibility of common indoor environments and lifestyles
- Re-assess the association using improved exposure assessment and country registry data on an extended population
- Select blood biomarkers and plasma microRNA signatures for early lung cancer screening
- Investigate whether differences in exposure including ethnicity lead to a substantial difference in particulate matter related cancer incidences

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