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NON-SMOKERS AND LUNG CANCER

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Non-Smokers and Lung Cancer

The major culprit producing lung cancer is smoking tobacco products, especially cigarettes, in excessive amounts. Smoking is the most dangerous public health threat in the world. The World Health Organization estimates that eight million people a year die from smoking tobacco (World Health Organization, 2022). Smoking tobacco products, especially cigarettes, in excessive amounts is the main cause of lung cancer. Even as the rate of lung cancer decreases each year, it still continues to be one of the world's most common cancers (World Health Organization, 2022).

Although lung cancer is known to be caused mainly by smoking, non-smokers also develop lung cancer. Of the eight million people who die from smoking, 1.2 million non-smokers die from exposure to secondhand smoke (World Health Organization, 2022). Non-smokers may also develop lung cancer from exposure to radon and air pollution; they can also get it through genetics.

Second-Hand Smoke Exposure

Second-hand smoke exposure occurs when inhaling smoke that is being exhaled by a smoker- from a cigarette smoldering in an ashtray or inhaling burning tobacco. Non-smokers

breathe in the substances that are generally the cause of cancer, such as $PM_{2.5}$, which is an air pollutant that easily damages the lungs, and particle pollution. When smoke enters the lungs, it can cause shortness of breath, respiratory irritation, and harm to the airways and small air sacs. The smoke enters the lungs rapidly, introducing toxic chemicals into the blood that travels through the whole body. Subsequently, the proper functioning of many vital organs is harmed - especially the heart, the vascular system, and blood - which can potentially result in a heart attack.

Radon Exposure

The second most common cause of lung cancer is exposure to radon. "Radon causes 21,000 lung cancer deaths each year. Radon is the leading environmental cause of any cancer" (CDC, 2023). Radon is a gas that is invisible, radioactive, colorless, and odorless. It can be found in rocks, water, and soil. Radon decays at an active and rapid speed and gives off small particles which can harm the cells that line the lung if inhaled. When buildings or homes have small cracks, it is possible for radon to go through those cracks and build up in the air. Breathing in too much radon over time increases an individual's chances of getting lung cancer. “When you breathe in radon gas, radioactive particles can get trapped in your lungs. These radioactive particles increase the risk of lung cancer. It may take years before health problems appear” (CDC, 2023). It usually takes between five to 25 years to develop lung cancer from radon (CDC, 2023).

There is no effective method to reduce the toxic effects of radon if it is already in the body. If there’s a possibility of excess exposure to radon, there should be a check-up with a doctor who may do screening tests to search for signs of lung cancer.

The Centers for Disease Control recommends reducing the chances of inhaling radon by "increasing airflow in your home by opening windows and using fans and vents to circulate air, seal cracks in floors and walls with plaster, caulk, or other materials designed for this purpose, ask about radon-resistant construction techniques if you are buying a new home" (CDC, 2022).

Air Pollution

Air pollution is another significant contributing factor for lung cancer. Air pollution is when toxic chemicals are in the air which are harmful to people to breathe in. It is caused by emissions from vehicles with internal combustion engines, fuel oils, and forest fires, among other ecological and environmental sources. Air pollution creates an atmosphere that encourages the growth of cells with cancer-causing mutations that are already present. Individuals can develop lung cancer from air pollution because it has the ability to damage airways, cause inflammation by going deep into the lungs, trigger asthma, and increase lung symptoms. People have the greatest chance of developing lung cancer in highly polluted environments, such as urban areas that contain different toxins in the atmosphere.

One of the most carcinogenic air pollution elements is a matter known as $PM_{2.5}$, which consists of small particles that decrease visibility and create a hazy sky. "Examining data from over 400,000 people, [scientists] found higher rates of other types of cancer in areas with high levels of $PM_{2.5}$" (Crick Institute, 2023). $PM_{2.5}$impairs the lungs' functioning causing shortness of breath, coughing, and throat and lung irritation.

There are several ways to minimize air pollution risks. First, avoid exercising outdoors on bad air days or near areas with a lot of traffic. Second, don't burn trash or wood. Third, even if a person is doing well, they should get regular check-ups. Lung diseases tend to be undetected until it starts getting serious. Therefore, it is essential to get regular checkups and x-rays, since it

is better to detect lung cancer in its earliest stages. Fourth, indoor air filters should be replaced according to the manufacturer's recommendations. Finally, always check the daily color-coded air quality index forecast to avoid the outdoors when the air quality is bad.

Particle Pollution

Particle pollution can also lead to lung cancer. Particle pollution consists of small particles in the air that are dust, dirt, soot, smoke, or liquid drops and solids. "Particles also can form indoors from complex reactions of gaseous pollutants emitted from such sources as household cleaning products and air fresheners" (California Air Resource Board, 2023). Particle pollution increases the chances of an individual getting heart disease, lung cancer, and asthma attacks. It also interferes with the proper growth and function of the lungs. The particles are often invisible to the human eye, so it's easy to be exposed to them unknowingly.

Genetics

Genetics also plays a significant role in lung cancer. If one's parents are diagnosed with lung cancer, a person's chances of getting lung cancer are increased. Genetic diseases can be passed from one generation to the next, but this only happens in some instances. In other cases, a new variant in the gene appears, which can help develop lung cancer in people who don't have a history of it in their family. Some people inherit certain mutations in the DNA sequence from their mother and father, which then dramatically expands the risk of them developing certain cancers. But inherited mutations by themselves aren't known to cause many lung cancers. "Your overall risk is still very low. Having a parent or sibling with lung cancer doesn't mean you'll get the disease. Only about 8% of lung cancers run in families" (Watson, 2021). Thus, the possibility of getting lung cancer through inheritance from parents is low. Genetics plays a role in developing lung cancer, not by inheritance, but by mutations.

Inherited diseases mean that they are passed down from parents. They are genetic disorders that occur when the genetic conditions are responsible for causing the disease. On the other hand, mutations are usually exclusively caused by genetics. Since a child gets their genes from their parents, they automatically are at risk of having changes in the DNA if the parent has them. Even if the parents don't have visible traits of it or are unaffected, it could potentially show up in the child. The changes in the genes that are related to lung cancer are mostly acquired during a person's lifetime rather than inherited. The mutations that are in the lung cells most of the time result from exposure to components in the environment, usually, for example, cancer-causing chemicals found in tobacco smoke.

To determine if lung cancer runs in one's family, genetic testing is done by obtaining a sample of a tissue of blood that has genetic material. When using this type of testing, doctors search for certain mutations. When the mutation is diagnosed, the doctors can reinsure a more strategic approach when it comes to treatment. Generally, doctors are able to see the changes in the lung cells that could trigger and add to cancer growth. It is mostly referred to as "biomarkers." Targeted treatments can also greatly improve a person's outlook. "These therapies have a prognosis of an average of 2–3 years," which "substantially improves the average survival rate, which was 9–12 months and still is for lung cancer without these mutations," (Fletcher, 2021)

Conclusion

The lungs are one of the most essential organs in the body; they get oxygen and add it to blood to circulate throughout the body. Despite the decreasing frequency of lung cancer, lung cancer remains one of the most common cancers in the world. It is widely recognized as a disease caused primarily by smoking, but that doesn't mean that non-smokers are safe from

getting lung cancer. A non-smoker can develop lung cancer without realizing it. They may be exposed to secondhand smoke, radon, and air pollution, or harbor genetically through mutations in the DNA. Non-smokers can protect themselves from lung cancer by avoiding places that have contaminated or polluted air, which is more acute in urban areas, and staying away from tobacco smoke.

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