

# Investigating the Relationship Between Lifestyle and Environmental Factors with the Incidence and Prevalence of Cancer

## Abstract

Cancer is the main cause of disability and death in the world. Most of the time, cancer is not related to a person's inherent biology and occurs mostly due to environmental reasons. Rapid and significant changes in the spread of cancer in recent years can only be attributed to the change and attitude of the population in the face of environmental factors. In this study, the available evidence about the environmental factors role and how they affect cancer incidence has been examined. According to the results, smoking, obesity, inactivity, unhealthy diet, air, water, and food pollution, and chronic viral infections are among the important risk factors in the occurrence of various cancers. However, it seems that the evaluation of the exposure level as well as the research methodology has been the main basis of the studies conducted regarding the relationship between environmental pollutants and cancer. Therefore, this disease should be considered from different aspects. The efforts of the scientific community and experts in this field to increase public awareness, gain the support of policymakers, and also create intersectoral coordination to improve lifestyles, reduce risky behaviors, and deal with water, air, and food pollution are strategically important to fight cancer. Based on this, conducting basic and clinical studies and interdisciplinary research for a good understanding of the pathophysiology of cancer and finding more cheaper and effective methods to prevent, diagnose, and treat cancer is necessary and needs the investment of government institutions and non-governmental organizations.

**Keywords:** Cancer, Prevalence of cancer, Lifestyle, Environmental factors

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## Introduction

Cancerization of cells, in other words, the start of abnormal cell growth due to changes in their deoxyribonucleic acid (DNA). Damaged and abnormal DNA may be inherited from parent to individual, but in most cases, DNA damage occurs as a result of mistakes made during normal cell reproduction or by an environmental factor. Sometimes DNA damage is caused by certain factors, but it is rare to find out what exactly caused the cancer in the individual in question.<sup>[1-3]</sup> However, genetic factors play an important role in the occurrence of cancer, based on research, they are not as decisive as environmental factors. Rapid and significant changes in the spread of cancer in recent years can only be attributed to the change and attitude of the population in the face of environmental factors. So far, many environmental exposures have been known that can cause cancer in humans. However, these assumptions are often suspended for several years without being able to provide evidence or convincing

evidence to accept or reject them, and this causes serious criticism of environmental epidemiology.<sup>[4-6]</sup>

In the current study, the available evidence about the environmental factors role and how they affect cancer incidence has been examined.

## Materials and Methods

In a common definition, the environment is related to all non-genetic factors and includes lifestyle factors including smoking, biological factors such as occupational exposures, nutrition, drugs, hepatitis viruses, and other factors. However, in a more specific definition, the environment contains all non-genetic agents that a person cannot directly control, or in other words, is not dependent on the direct choice of the person. Based on this, the articles and data released by the American Cancer Society, the IARC (International Association for Research on Cancer) affiliated with the World Health

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Organization, and the UICC (Union for International Cancer Control) somehow relate to the environmental role of pollutants in the prevalence and incidence cancer had been considered in the compilation of this article.

## Results and Discussion

Unexplained weight loss, loss of appetite, fatigue (excessive fatigue), fever, skin changes, and pain are signs of cancer.<sup>[7, 8]</sup> Along with common symptoms, changes in bladder or bowel habits function, sores that won't heal, white spots on the tongue or white patches inside the mouth, unusual discharge or bleeding, breast tenderness or lumps, or other Body spots, indigestion or swallowing problems, any new alter in the skin, annoying hoarseness or cough, etc. are some of the symptoms and signs of certain cancers.<sup>[1]</sup>

The cancer incidence in the world is high and the death rate because of the cancer is increasing in different countries. Every year, about 8 million new cancers are added in the world and 5.3 million people die due to cancer every year. This is even though 65% of them are in developing countries and the main cancer burden is in Asia and Southeast Asia.<sup>[9, 10]</sup> It is predicted that by 2025, the incidence rate of cancer will increase and 20 million people will be diagnosed with cancer per year. In addition, 11 million people die from cancer, which will rise from 59% to 70% in developing countries. However, the prevalence of cancer in any society may be different in other societies. In 140 countries of the world, breast cancer is the most common cancer among women, and among men, lung and prostate cancer are among the most common diseases.<sup>[9, 11]</sup>

According to the documentation and scientific evidence, the main risk factors for cancer are rooted in lifestyle and risky behaviors that are often preventable. The International Agency for Research on Cancer (IARC) has classified more than 100 human carcinogens.<sup>[10, 12]</sup> These factors are classified into 4 groups: carcinogenic to humans, potentially carcinogenic to humans, probably carcinogenic to humans, and unlikely to be carcinogenic to humans.<sup>[13]</sup>

### Tobacco

Smoking is the most important cause of death from cancer worldwide. Smoking causes a lot of cancer and one-fifth of all global cancer deaths are related to smoking. Tobacco includes a wide range of harmful substances, including nicotine, which creates polycyclic hydrocarbons, N-nitroso compounds, and aromatic amines. Smoking significantly increases the risk of developing different types of cancer, including lung, esophagus, oral cavity, pharynx, and larynx.<sup>[14-16]</sup> By 2030, tobacco will kill 8 million people annually.<sup>[16]</sup>

While smoking is decreasing in high-income countries, it is increasing in many middle- and low-income countries. For example, between 1990 and 2009, smoking in Western Europe decreased by 26%. Meanwhile, in the Middle East and Africa, this trend has increased by 57%. Likewise, fewer smokers in low and medium HDI countries quit smoking using middle age. The human development index is a statistic composed of

indicators of education, life expectancy, and per capita income, which is utilized to rank countries. According to the latest report announced in 2015, Norway ranks first in human development with an HDI of 0.944, followed by Australia, Switzerland, and Denmark. The United States of America ranks 8th with an HDI of 0.915. However, there are still no accurate statistics on the number of middle-aged quitters. It should be noted that quitting smoking at this age could reduce the chance of lung cancer by more than 60%.<sup>[17]</sup> In addition, the increase in smoking in areas where the prevalence of smoking is increasing is more about women.<sup>[16]</sup>

In high-income countries, modern tobacco products such as lozenges, snuff, and chewing tobacco are used as alternatives in smoke-free environments. Such products are also not safe; they expose the body to all the above substances except aromatic hydrocarbons and can cause unknown effects.<sup>[18]</sup> In addition, non-smokers exposed to tobacco smoke are at risk of developing lung cancer and other cancers. Cigarette smoke is highly lethal due to 21,400 lung cancer deaths worldwide each year.<sup>[14]</sup>

### Infection

A large proportion of new cancer cases in low-income countries, especially in sub-Saharan Africa and Asia, are infection-related. Cervical cancer remains one of the leading causes of cancer-related deaths in women in many less-developed countries of the world, where treatment and screening are unavailable or limited.<sup>[7]</sup>

Worldwide, infectious factors are responsible for about 2 million novel cancer cases per year (16.1% of cancers). The burden of infection-related cancers is more in less developed countries (32.7% in sub-Saharan African countries vs 22.9% overall) compared to more developed regions (7.4%). Human papillomavirus, *Helicobacter pylori*, and hepatitis B and C viruses are the four main causes of infectious cancers and are responsible for the majority of infection-related cancers in the world (mainly stomach, neck, uterine, and liver cancers, respectively).<sup>[3, 19-21]</sup>

*Helicobacter pylori* infection, along with improper diet, plays an important role in causing stomach cancer and is responsible for about 90% of stomach cancer cases worldwide and about 33% of all infection-related cancers. The infection prevalence is higher, especially in less developed areas, but it has decreased in recent generations.<sup>[19]</sup> The most important factor in reducing stomach cancer in developed countries, including the United States, was reported to be the use of refrigerators to improve socioeconomic status and health. According to studies, lack of oral and dental hygiene is one of the most effective factors in the increase of gastrointestinal cancers. Therefore, gastrointestinal cancer can be considered social cancer, which requires a deeper look to prevent and treat this disease.<sup>[9]</sup>

During the last century, viruses have had a different history in cancer biology and have either been recognized as the main cause of cancer or, on the other hand, have been ignored in an

insignificant way for this disease. Now there is evidence that shows that a significant proportion of cancers are caused by viruses. Human papillomavirus (HPV) accounts for about 28% of all infection-related cancers worldwide. Resistant HPV infection is responsible for almost all cervical cancers and several other cancers. Although there are more than 100 types of HPV (HPV types 18 and 16 cause approximately 90% of other HPV-related cancers).<sup>[20, 21]</sup>

Chronic infections caused by HCV (hepatitis C virus) or HBV (hepatitis B virus) cause more than 28% of all cancers and 75% of liver cancers. These diseases are the most common infectious causes of cancer among men in less developed countries of the world. In addition, HCV infection causes some cases of non-Hodgkin's lymphoma.<sup>[21]</sup> Less common infections that cause cancer are EBV, Kaposi's sarcoma-associated herpesvirus, liver flukes, and schistosomiasis. Infection with *Schistosoma haematobium* is the cause of bladder cancer and infection with *Schistosoma japonicum* has been associated with stomach, colorectal, and liver cancer. HIV (Human immunodeficiency virus) infection also indirectly causes some cancers, especially those related to infection. Most likely, future research will be able to identify both other infections that cause cancer and more cancers that are related to the known infections.<sup>[3, 21]</sup>

Global developments related to development (such as sanitation) and primary prevention may reduce the burden of infection-related cancers. Prevention is the key to dealing with the increasing burden of cancer, especially in middle-income or low-income countries with weak health systems. Therefore, there is a requirement to develop low-cost preventive and therapeutic measures to be used in communities with limited resources where infection-related cancers are very common.<sup>[21]</sup>

### Nutritional factors and physical activity

People's lifestyle is the third main cause of cancer. Excess weight, improper diet, and inactivity are factors that contribute to cancer. While future research is progressing to better understand the role of these factors in causing cancer. New results show that each of these factors can affect the cancer risk.<sup>[22, 23]</sup>

A diet rich in plant foods, including non-starchy vegetables and fruits, is related to the lower risk of certain cancers. In addition, this diet type contains less red meat and meat products, which are related to an increased risk of colon cancer.<sup>[22]</sup> Alcohol increases the cancer risk and accounts for 4% of cancer deaths.<sup>[24-26]</sup> Furthermore, lifestyle factors and diet have metabolic consequences (such as inflammation) that increase the chance of developing cancer.<sup>[22]</sup>

The chance of some cancers, especially colon, esophagus, and uterus cancer, increases with overweight and obesity. At the same time, we are currently facing an obesity epidemic in all countries and all income levels. The available evidence also shows that being overweight is related to an increased risk of cancer recurrence and shortens life after cancer. Movement and physical activity alone (without taking into account body

weight, diet, and other factors) have been related to a decreased risk of certain cancers, while 31% of adults worldwide follow the recommendations of the World Organization. Based on 150 minutes of moderate physical activity or its equivalent per week, they do not act.<sup>[27]</sup>

While a person's lifestyle can reduce or increase the cancer risk, civil societies and governments have the responsibility of developing nutritional and economic policies leading to health, creating an environment that supports physical activities, and developing interventions that children and target young people.<sup>[28]</sup>

### UV radiation

UV radiation causes skin cancer, which is the most common type of cancer. UV rays are a major risk factor for skin melanoma. Annually, about 23,000 cases and 55,000 deaths from melanoma are estimated worldwide.<sup>[28]</sup> In addition, UV radiation also causes keratinocyte skin cancer (non-melanoma), which is the majority of skin cancer in humans with more than 13 million cases per year. Although keratinocyte cancer rarely leads to death, it carries a significant burden of death and economic costs.<sup>[29]</sup> The sun is the main source of UV radiation, and the amount of UV radiation received at every point on the earth's surface is related to the location's altitude and latitude, time of year and day, air pollution, and cloud cover. In addition, the level of UV radiation depends on the thickness of the ozone protective layer in the stratosphere.<sup>[28, 30]</sup>

Personal exposure to artificial UV radiation, which may occur with tanning devices or the like, is 10-15 times stronger than midday summer sunlight in southern Europe. Although this type of radiation is classified as a human carcinogen, it is commonly used for cosmetic purposes. In some countries, both men and women use beach beds, which increases the skin cancer risk in the coming years of life.<sup>[31]</sup> In addition to environmental UV radiation and exposure to sunlight (occupational and recreational), other risk factors for skin cancer, such as sensitivity to sunlight and light skin, are characteristics that a person inherits from their parents. Skin cancer rates are very low in people with naturally dark skin. On the other hand, this rate is much higher in people who have fair hair and skin, green or blue eyes, and many freckles. In addition, the risk is higher in children who are exposed to high UV radiation.<sup>[28, 29]</sup>

### Environmental pollutants and occupational exposures

Pollution with chemicals in the work or living environment, or the use of food and drinks contaminated with chemicals and heavy metals, is another cause of cancer. Environmental pollution includes water, soil, and air pollution, all of which can seriously endanger the health of society and cause cancer. The risk attributable to environmental factors of cancer in the preliminary studies conducted in this regard is unclear and estimated to be less than 3-4%. Studies conducted after the early 1980s have provided extensive and new evidence regarding environmental exposures related to cancer, including the presence of arsenic in water and exposure to

radio waves because of the widespread application of mobile phones. However, there is no accepted general and comprehensive estimate of the attributable risk for environmental cancer, and the estimates made regarding particular risk factors also have significant differences.<sup>[32, 33]</sup>

What makes it difficult to conclude the relationship between exposure to environmental pollutants and cancer in humans is the inherent characteristics related to these compounds' toxicity and the methodological aspects of the epidemiological study applied. Indeed, it can be said that the evaluation of the exposure level as well as the study methodology has been the main basis of all the studies conducted regarding the relationship between environmental pollutants and cancer. The combination of strong study design, advanced exposure evaluation along with a better understanding of the disease mechanism and the use of exposure biomarkers can lead to the strengthening of epidemiological evidence. In work environments and under special working conditions, many substances and compounds are known to cause cancer in workers. According to the duration or intensity of this exposure, the burden of cancer among workers can be very high. About 4-5% of all cancers in developed societies are due to occupational factors.<sup>[9]</sup> Although limiting the amount of exposure can be very effective in preventing these types of cancers, in middle- and low-income countries, these occupational exposures are still a particular concern. Compared to high-income countries, in these countries, the exposure rate is likely to be higher, there is less strictness regarding the laws and regulations applied, and hazardous exposures happen in small industrial workshops.<sup>[13, 34]</sup> For example, Asbestos, which is one of the important causes of occupational lung cancer and the unique factor of malignant mesothelioma, as a rare and deadly cancer, was used in industrialized countries for purposes such as brake pad insulation and fire protection until 1980. However, exposure to Asbestos remains an environmental and occupational risk in many countries.<sup>[35]</sup>

## Conclusion

Cancer is the main cause of disability and death in the world. Most of the time, cancer is not related to a person's inherent biology and occurs mostly due to environmental reasons. A significant cause of cancer deaths, especially in men, is due to smoking. To decrease these deaths, countries should work on preventing the initiation of smoking among young people and encourage smokers to quit. In low-income countries, especially in sub-Saharan Africa and Asia, a high relation of cancer cases are created by infection. In addition, physical inactivity/activity and diet can impact the cancer risk. In such a way regarding some cancers in the body, excess weight is considered a risk factor. Support and education regarding sun protection are necessary for all members of society, the health care system, families, workshops, schools, mass media, and organizations. One of the important points of these studies is that it is difficult to assess the exposure level as well as the study methodology regarding the impact of occupational and environmental pollutants on the prevalence and incidence of

cancer in society. Although it is the combination of various factors and their mutual effects that ultimately leads to the cell becoming cancerous, based on the studies conducted in recent years, environmental factors play a decisive role in the spread and occurrence of this disease. The efforts of the scientific community and experts in this field to increase public awareness, gain the support of policymakers, and also create intersectoral coordination to improve lifestyles, reduce risky behaviors, and deal with water, air, and food pollution are of strategic importance to deal with cancer.

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## Conflict of interest

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## Ethics statement

None.

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