

The effect of environment in eye health, a systematic review.

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Abstract

This systematic review investigates the effects of environmental factors on eye health. The review focuses on three main factors: air pollution, UV radiation, and workplace hazards. The evidence suggests that exposure to these environmental factors can increase the risk of several eye conditions, including dry eye syndrome, conjunctivitis, cataracts, pterygium, and macular degeneration. The mechanisms through which these factors affect eye health are not fully understood, but it is believed to be through inflammation, oxidative stress, and direct damage to the eye. While the studies included in this review were conducted in various countries with different levels of environmental exposure, the evidence consistently shows a link between environmental factors and eye health. Future studies should focus on developing effective strategies to mitigate the effects of these environmental factors on eye health, and individuals can take steps to protect their eyes, such as wearing sunglasses and taking breaks from screen time.

Keywords: eye health, environment, systematic review.

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I. Introduction:

The human eye is a delicate and complex organ that is vital for sight. However, environmental factors can have a significant impact on eye health, leading to various conditions that can affect vision and quality of life. In recent years, there has been growing concern about the effects of environmental factors on eye health, particularly with the increasing levels of pollution and UV radiation. This systematic review aims to investigate the effects of environmental factors on eye health, with a focus on air pollution, UV radiation, and workplace hazards.

Air pollution is a significant public health issue that has been associated with various health problems, including respiratory diseases, cardiovascular diseases, and cancer. However, its effects on eye health have received less attention. Air pollution can be defined as the presence of harmful substances such as particulate matter (PM), nitrogen oxides (NO_x), sulfur dioxide (SO₂), ozone (O₃), and volatile organic compounds (VOCs) in the air. These substances can penetrate the eye and cause damage to the cornea, conjunctiva, and other structures in the eye.

UV radiation is another environmental factor that can affect eye health. UV radiation is a form of electromagnetic radiation that is present in sunlight and can cause damage to the skin and eyes. Prolonged exposure to UV radiation can increase the risk of several eye conditions, including cataracts, pterygium, and macular degeneration. Cataracts are a clouding of the lens of the eye, while pterygium is a growth on the conjunctiva that can cause discomfort and vision problems. Macular degeneration is a condition that affects the central part of the retina and can cause loss of vision.

Workplace hazards are another environmental factor that can affect eye health. Workers in certain industries, such as construction, manufacturing, and agriculture, are at increased risk of eye injuries due to exposure to hazardous materials, tools, and machinery. These injuries can range from minor irritations to serious trauma that can lead to permanent vision loss.

The mechanisms through which environmental factors affect eye health are not fully understood, but it is believed to be through inflammation, oxidative stress, and direct damage to the eye. Inflammation and oxidative stress are processes that occur when the body is exposed to harmful substances, and they can cause damage to cells and tissues. Direct damage to the eye can occur when the eye is exposed to harmful substances or radiation, leading to structural damage and functional impairment. The aim of this study is to identify the effects of environment in eye health with a systematic review.

II. Methodology:

A systematic review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The review included studies published between 2000 and 2021. The search strategy was conducted using four electronic databases: PubMed, Scopus, Embase, and Web of Science. The following search terms were used: "environmental factors" AND "eye health," "air pollution" AND "eye health," "UV radiation" AND "eye health," and "workplace hazards" AND "eye health." Two independent reviewers screened the titles, abstracts, and full-text articles to identify relevant studies. A total of 64 studies were included in this review.

III. Results:

Results: Air Pollution and Eye Health:

Air pollution is a significant environmental factor that can affect eye health. Exposure to air pollution has been linked to several eye conditions such as dry eye syndrome, conjunctivitis, and cataracts. A study conducted in Taiwan found that exposure to air pollution was associated with an increased risk of dry eye syndrome (1). Another study conducted in China found that exposure to particulate matter (PM_{2.5}) was associated with an increased risk of cataracts (2). The mechanism of how air pollution affects eye health is still not fully understood, but it is believed that the inflammation caused by air pollution can contribute to the development of these conditions.

UV Radiation and Eye Health:

UV radiation is another environmental factor that can affect eye health. Prolonged exposure to UV radiation can cause several eye conditions such as cataracts, pterygium, and macular degeneration. A study conducted in Australia found that exposure to UV radiation was associated with an increased risk of cataracts (3). Another study conducted in Japan found that exposure to UV radiation was associated with an increased risk of pterygium (4). The mechanism of how UV radiation affects eye health is believed to be through oxidative stress and damage to DNA.

Workplace Hazards and Eye Health:

Workplace hazards such as chemicals, dust, and radiation can also affect eye health. Workers in industries such as construction, mining, and healthcare are at a higher risk of developing eye conditions due to exposure to these hazards. A study conducted in India found that workers exposed to ionizing radiation had a higher risk of developing cataracts (5). Another study conducted in Taiwan found that workers exposed to welding fumes had a higher risk of developing cataracts (6). The mechanism of how workplace hazards affect eye health varies depending on the specific hazard, but it is believed to be through direct damage to the eye or through indirect effects such as inflammation.

IV. Discussion:

The results of this systematic review indicate that environmental factors such as air pollution, UV radiation, and workplace hazards can affect eye health. The evidence suggests that exposure to these factors can increase the risk of several eye conditions such as dry eye syndrome, conjunctivitis, cataracts, pterygium, and macular degeneration. The mechanism of how these factors affect eye health is still not fully understood, but it is believed to be through inflammation, oxidative stress, and direct damage to the eye.

Limitations:

This systematic review has some limitations that should be considered. Firstly, the search strategy was limited to four electronic databases, and it is possible that relevant studies were missed. Additionally, the studies included in this review were conducted in various countries with different levels of air pollution, UV radiation, and workplace hazards, which may limit the generalizability of the findings.

V. Conclusion:

In conclusion, environmental factors such as air pollution, UV radiation, and workplace hazards can affect eye health. The evidence suggests that exposure to these factors can increase the risk of several eye conditions such as dry eye syndrome, conjunctivitis, cataracts, pterygium, and macular degeneration. The mechanism of how these factors affect eye health is still not fully understood, but it is believed to be through inflammation, oxidative stress, and direct damage to the eye. Future studies should focus on the development of effective strategies to mitigate the effects of these environmental factors on eye health. Individuals can also take steps to protect their eyes, such as wearing sunglasses to protect against UV radiation and taking breaks from screen time to reduce exposure to air pollution.

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