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# ATMOSPHERIC POLLUTION AND THE EFFECTS ON THE INTERRELATIONSHIP OF HEALTH AND ENVIRONMENT

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**Abstract:** This study addressed the impacts of air pollution on the environment and human health, based on a literature review. The results indicated that exposure to air pollution is associated with respiratory and cardiovascular diseases, in addition to causing damage to the environment. To minimize these effects, it is necessary to adopt public policies and behavioral changes that aim to reduce air pollution and its negative impacts.
**Keywords:** Atmospheric pollution; Air quality; Environment; Human health.

## INTRODUCTION

Atmospheric pollution affects human health and the environment, generating effects that place populations and ecosystems at risk (FURRIELA et al. 20021).

The presence of foreign elements in the atmosphere, in concentrations sufficient to cause direct or indirect impacts on the health, safety and well-being of living beings, can be defined as atmospheric pollution. Such elements can come from human activities or natural processes (ELSOM, 1992).

According to Lima et al. (2019), air pollutants include gases, particles and volatile organic compounds, which are emitted from industrial sources, vehicles, agricultural activities and the burning of fossil fuels. Prolonged exposure to these pollutants can lead to a variety of health problems, including respiratory, cardiovascular and neurological diseases.

The World Health Organization (WHO) warns that air pollution is the main environmental cause of premature death worldwide, responsible for approximately 7 million deaths annually (INSTITUTO NATIONAL DO CANCER, 2021).

The damage is to both human health and the environment, contributing to climate change, soil acidification, degradation of water quality and a decrease in biodiversity

(GILES et al., 2001; VALLS, 2017). Therefore, air pollution control is a critical issue for the protection of life, disease prevention and a balanced environment.

Understanding the effects of air pollution on human health and the environment is a crucial factor in developing effective actions aimed at promoting quality of life and preserving ecosystems. Accurately identifying the mechanisms through which air pollution affects human health and the environment can provide valuable information for designing public policies that reduce air pollution levels and minimize negative impacts on health and the environment.

It is important to highlight that carrying out research on air pollution and its effects on human health and the environment is fundamental to understanding the problems arising from this issue. The present work, in turn, represents an important effort in this direction, as it comprehensively and carefully analyzed data from the scientific literature available on the subject from 1992 to 2021, in order to elucidate the interrelationship between health and environment, through this problem.

## MATERIAL AND METHODS

To carry out this literature review, the research question that guided the study was established: "To what extent does air pollution affect human health and the environment?". Next, a data search was carried out in the scientific databases SciELO, PubMed, LILACs, Google Scholar. The search strategy used the descriptors "atmospheric pollution", "environment", "human health", "negative effects", "respiratory diseases" and "climate change". The terms were combined with Boolean operators such as "AND" and "OR" to refine the search.

The review included scientific articles, theses, booklets, published between 1992 and 2021 in Portuguese, English and Spanish, which addressed the effects of air pollution on the environment and human health. Articles that were not directly related to the review topic or that did not use rigorous scientific methods were excluded. The selection of articles was carried out in two stages, in the first stage the titles and abstracts of the articles were read and evaluated for relevance to the research question, in the second stage, the articles selected in the first stage were read in full and evaluated for relevance. methodological quality and contribution to the review.

## RESULTS AND DISCUSSION

Air pollution is a global environmental problem that directly affects the quality of life of populations around the world. Major air pollutants include fine particulate matter (PM2.5), ground-level ozone (O3), nitrogen dioxide (NO2), and sulfur dioxide (SO2). These pollutants are emitted by various sources, including the burning of fossil fuels, industry and vehicle traffic (EPA, 1995, apud SANTOS, 2016).

The effects of air pollution on the environment include soil acidification, degradation of water quality, as well as contributing to global warming and climate change (FLOWER, 2006).

Acid rain is a phenomenon that arises through the combination of substances released by the burning of fossil fuels, such as coal and oil, and waste, including sulfur dioxide and nitrogen oxides, with oxygen, water and other oxidizing elements found In the atmosphere. This process creates acidic compounds that end up falling on the Earth's surface in the form of wet deposition that can be incorporated into rain, snow or humidity in the air, or in a dry form that accompanies particulate materials (PIRES, 2006).

Through surveys, gathered in a single work, CALLEGARO, et al., (2015), showed that acid

rain can change the pH of the soil, impairing the absorption of nutrients by plants.

The acidification of water bodies, caused by acid rain, can have devastating effects on the health of animals that depend on these ecosystems, as well as on aquatic biodiversity. Acid rain causes the release of aluminum through chemical processes in contact with the soil and granite rocks present in streams and lakes. The high presence of this chemical element dissolved in water can lead to physiological changes in fish, making them less efficient in competing for food and habitat, resulting in lower body weight, smaller size and decreased reproductive success. Acidification also affects shell-forming molluscs (as their calcareous shell or skeleton can dissolve in an acidic environment); shellfish; coral reefs; seagrass beds and juvenile stages of aquatic organisms. Overall, acidification has significant consequences for the health of aquatic ecosystems and their inhabitants (SIVARAMANAN, 2015).

Recently, atmospheric pollution has been the subject of great interest, especially because many of its agents are greenhouse gases, directly linked to global warming, a topic that is widely debated today. Human activity is mainly responsible for the emission of these pollutants into the atmosphere (JERÔNIMO, 2009).

Atmospheric pollution also has direct impacts on human health, according to (CANÇADO et al., 2006), they comment that, in recent years, research has discovered coherent evidence regarding the effects of fine particulate matter on health, especially in relation to morbidity and mortality from cardiovascular diseases such as those that affect the heart, arteries and brain. These effects include both acute impacts, such as hospitalizations and deaths from arrhythmia, ischemic heart and brain diseases, and chronic impacts resulting from long-term exposure, such as increased mortality from cerebrovascular and heart diseases.

The people most susceptible to illnesses caused or worsened by air pollution are children, the elderly and individuals who have a previous history of respiratory or cardiovascular diseases. In children, morbidity and mortality are strongly associated with diseases of the respiratory system, such as asthma, bronchitis and acute infections, while in the elderly, morbidity and mortality are more related to cardiovascular diseases, although there is still a high rate of hospitalizations due to respiratory illnesses in this age group. It is likely that the greater susceptibility of the elderly to air pollution is due to the presence of pre-existing diseases, physical weakness and the lower capacity of the respiratory system to deal with pollutants (SILVA, et al., 2010). Furthermore, according to Reis (2009), in a survey carried out, it was observed that air pollution has negative impacts on maternal and child health, including an increased risk of prematurity, low birth weight, fetal morbidity and mortality.

Air pollution prevention and control strategies include mitigation measures, such as reducing pollutant emissions through public transport policies, encouraging the adoption of electric vehicles, improving energy efficiency and promoting clean energy sources and renewable. Furthermore, the protection of public health must be considered a priority in the formulation of public policies related to the environment. Adopting adaptation measures, such as developing early warning systems and increasing access to health services, are also important to reduce the impacts of air pollution on human health.

In short, air pollution is a complex problem that affects both the environment and human health. The literature review carried out in this work made it possible to identify the main effects of air pollution and the prevention and

control strategies necessary to minimize its negative impacts. The protection of public health must be considered a priority in the formulation of public policies related to the environment, with the aim of guaranteeing a sustainable future for future generations.

## CONCLUSION

Based on the results presented in this study, it is clear that air pollution is a serious global environmental problem that directly impacts the quality of life of populations around the world. The consequences of air pollution for the environment and human health are worrying and require urgent action on the part of governments, international organizations, companies and civil society.

In this context, health protection must be considered a priority in the formulation of public policies related to the environment. Mitigation and adaptation measures, such as reducing pollutant emissions, encouraging the adoption of electric vehicles and promoting clean and renewable energy sources, improving early warning systems and increasing access to health services, are fundamental to minimizing the negative impacts of air pollution on human health and the environment.

It is important to highlight that the adoption of these measures is not only an environmental issue, but also an economic and social one. Reducing pollutant emissions can generate significant savings in public health, in addition to contributing to the creation of jobs in sectors related to clean and renewable energy.

Finally, raising awareness about the effects of air pollution is essential so that society can understand the importance of adopting mitigation and adaptation measures. It is necessary for governments, international organizations, companies and civil society to work together to promote awareness about air pollution and develop effective solutions to minimize this global environmental problem.

| **Effects of air pollution** | **Mitigation and adaptation measures** |
|---|---|
| Human exposure to toxic, carcinogenic, teratogenic and mutagenic substances - fine particles (PM2.5), ozone (O3), nitrogen dioxide (NO2) and sulfur dioxide (SO2). | Social participation in monitoring and mitigating air pollution; environmental education for awareness and community articulation; solidarity and shared responsibility in relation to air quality. |
| | Economic policies for the adoption of electric vehicles, such as tax exemptions and the creation of financing programs. |
| Soil acidification, degradation of water quality; change in soil pH, impairing nutrient absorption by plants | Investment in clean and renewable energy sources, such as solar energy and wind energy. |
| | Incorporate more advanced technologies and expand the sensor network to cover wider and more diverse areas, allowing us to more efficiently identify and track the origin and behavior of atmospheric pollutants. |
| | Expanding access to quality health services, especially for vulnerable groups, such as the elderly, children and people with chronic respiratory diseases. |

Table 01 presents mitigation and adaptation measures that can be adopted to minimize the impacts of air pollution:

Source: Authors

These measures are just some of the possible solutions to minimize the impacts of air pollution. A joint and continuous effort is needed to combat this environmental problem and promote the protection of public health and the environment.

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