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PBL3: Creative Design (G1)

Literature review

Air pollution's effect on pre-existing health conditions:

This literature review will discuss pre-existing health conditions and their effect on air pollution mortality rates. According to World Health Organization (WHO), around 92% of the world's population lives in areas exposed to air pollution levels exceeding the WHO's recommended pollution exposure amount. Following the claim, roughly seven million people's death is recorded each year from air pollution (Bălă, G. P., Râjnoveanu, R. M., Tudorache, E., Motișan, R., & Oancea, C., 2021). As high as these numbers are, according to multiple researchers in this field, researchers found a higher risk of mortality due to air pollution in groups of people with certain health complications. These health issues are cardiovascular, type-2 diabetes, and respiratory diseases.

Cardiovascular disease is a term that describes illnesses concerning the heart and blood vessels. In the research paper 'Expert position paper on air pollution and cardiovascular disease,' the researchers found that for a healthy individual short-term exposure to every 10 mg/m³ air pollution increased their mortality rate by 1%, and for a person with cardiovascular disease it increased it by 1.8%. This statement means people with pre-existing cardiovascular disease are 1.9 times more likely to die from air pollution than healthy individuals (Newby, D. E., Mannucci, P.

M., Tell, G. S., Baccarelli, A. A., Brook, R. D., Donaldson, K., ... & Storey, R. F., 2015). When a person breathes polluted air, it can make the blood vessels widen and unable to relax. When this scenario continues for a long enough time, the blood in the person with cardiovascular disease clots and increases their blood pressure, thus increasing their chances of having a stroke (Lee, B. J., Kim, B., & Lee, K., 2014).

Type-2 diabetes (T2D) is a term used when a person's pancreas produces less insulin than it is supposed to, causing the sugar level in the blood to exceed the recommended amount. In the research paper 'Epidemiology of air pollution and diabetes,' researchers Thiering and Heinrich stated that people with diabetes were twice as much at risk of dying as those without diabetes. When a person with diabetes breathes excessive amounts of air pollution, the fine particles of particulate matter in the air cause inflammation in the body. This inflammation further affects the body by disrupting the person's sugar metabolism and insulin sensitivity. Impacted by these additional conditions, the diabetic person is exposed to more harm, increasing their mortality risk (Thiering, E., & Heinrich, J., 2015).

Respiratory disease is a term that covers diseases affecting a person's lungs and respiratory system. In the research paper 'Expert position paper on air pollution and cardiovascular disease,' the researchers found that for a healthy individual short-term exposure to every 10 mg/m³ air pollution increased their mortality rate by 1%, and for a person with respiratory disease it increased it by 2.5%. This statement means people with pre-existing cardiovascular disease are 2.5 times more likely to die from air pollution than healthy individuals (Newby, D. E., Mannucci, P. M., Tell, G. S., Baccarelli, A. A., Brook, R. D., Donaldson, K., ... & Storey, R. F., 2015). When a person with respiratory disease breathes air pollution, the pollutants inflame the epithelium and

the airway neuroreceptors. This inflammation causes the airway to be hyperresponsive and leaves the individual unable to breathe freely (Bălă, G. P., Râjnoveanu, R. M., Tudorache, E., Motișan, R., & Oancea, C., 2021).

In conclusion, some diseases, such as the ones listed in the literature review, can potentially increase air pollution's negative impacts on the body up to two times more than on a healthy individual.

References:

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Thiering, E., & Heinrich, J. (2015). Epidemiology of air pollution and diabetes. *Trends in Endocrinology & Metabolism*, 26(7), 384-394.

Bălă, G. P., Râjnoveanu, R. M., Tudorache, E., Motișan, R., & Oancea, C. (2021). Air pollution exposure—the (in) visible risk factor for respiratory diseases. *Environmental Science and Pollution Research*, 28, 19615-19628.

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