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Adverse Effects of Air Pollutants on Children's Health and Effects on Mortality

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Introduction

A vast number of epidemiological studies have found a link between air pollution exposure and a variety of illness and death outcomes in children. Criteria air pollutants are six types of air pollutants that are controlled based on their potential to harm human health and/or the environment: Ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide, and lead are some of the pollutants that can be found in the air.

Effects of air pollution on children's health

Effects on mortality

Increased mortality in children and adults has been related to ambient air pollution. Sudden infant death syndrome (SIDS), a significant cause of postneonatal mortality, has been linked to air pollution exposure. Observed a continuous and substantial relationship between PM and postneonatal mortality owing to respiratory causes, as well as sudden infant death syndrome, in a comprehensive assessment of the literature on the association between ambient air pollution and newborn mortality [1].

Pregnancy complications

Premature delivery, low birth weight, intrauterine growth retardation, abnormal birth length, abnormal head circumference, and small size for gestational age have all been linked to elevated levels of hazardous air pollutants in the environment. However, no single trimester of pregnancy has been identified as the most susceptible time for the foetus to be exposed to air pollution [2].

Consequences of poor respiratory health

Ambient levels of criterion air pollutants have been linked to a number of acute and chronic deleterious respiratory health consequences in both asthmatic and nonasthmatic children, with asthmatic children being more vulnerable to the negative health effects of ambient air pollution [3]. Several studies have linked ambient air pollution to an increased prevalence of asthma symptoms, as well as an increased incidence and prevalence of childhood asthma, particularly among children who participate in sports on a regular basis and who use more asthma medication, as well as increased asthma emergency department visits and hospitalisation due to asthma.

There is evidence that present levels of ambient air pollution may induce growth deficiencies in children's lung function. Ambient air pollution has been linked to an increase in nonasthmatic children reporting respiratory symptoms, as well as an increase in respiratory hospital admissions and emergency department visits. Children's immune systems have been proven to be harmed by exposure to ambient levels of criteria air pollutants [4].

Increased risk of rickets due to vitamin D deficiency

Children in the tropics who live in locations with greater levels of ambient air pollution have been demonstrated to have a higher risk of getting vitamin D deficient rickets than those who live in less polluted areas. The quantity of ultraviolet B solar radiation reaching ground level has been found to be inversely linked to ambient air pollution levels (haze). The conversion of 7-dehydrocholesterol to cholecalciferol (vitamin D3) requires ultraviolet B energy produced by the sun [5].

Effects on neurological development

The importance of cognitive function, as well as the rising prevalence of neurodevelopment disorders such as developmental delay, attention deficit hyperactivity disorder (ADHD), and autism spectrum disorders (ASD), has prompted a slew of studies looking into early life exposure to ambient air pollution. Epidemiological research have looked at the effects

of prenatal $PM_{2.5}$ exposure on structural changes, cognitive function, and the risk of clinically diagnosed illnesses. Children with thin cortex in numerous areas of the brain and poor inhibitory control were found in a research evaluating prenatal $PM_{2.5}$ exposure. Other mental health issues, such as addictive behaviour and ADHD, are linked to impaired inhibitory control. Prenatal $PM_{2.5}$ exposure has also been linked to a reduction in basic cognitive functions such as working memory and the conflict attentional network. Growing data from individuals shows that developing $PM_{2.5}$ exposure affects neurobehavioral function and contributes to cognitive impairment [6]. On the basis of this expanding epidemiological data, advancing air pollution policy for the protection of children's health and promotion of healthy brains, comparable to lead poisoning prevention and reduction of cognitive impairments, is justified.

Prenatal exposure to fine PM is clearly associated with numerous adverse effects in children, including acute birth outcomes and chronic respiratory effects, according to the numerous epidemiological studies summarised, with a growing body of literature indicating cognitive and metabolic dysfunction [7]. Ultrafine particles (UFPs, $PM_{0.1}$) are thought to have increased toxicity due to their higher surface area/mass ratio, increased oxidative capability, and potential to translocate into systemic circulation, despite the fact that they are not currently controlled by air quality regulations.

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