



A REVIEW OF INDOOR AIR POLLUTION AND ITS HEALTH EFFECTS

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ABSTRACT: Indoor Air Pollution (IAP) is a critical issue with broad ramifications. The objective of the current review is to give a thorough understanding of the major emission sources of indoor air pollutants, health impacts, and an understanding of the relationship between indoor air pollution and health as well as to suggest cutting-edge methods for reducing indoor air pollution. With the goal of determining the occurrence and exposure to indoor air pollution, exposure assessment, and control options to address the issue, an overview of the studies carried out globally has been included in the review.

Keywords: Indoor air pollution; indoor air quality; household air pollution (HAP); health effects; respiratory infections; COPD.

1. INTRODUCTION

Indoor air pollution refers to the presence of pollutants in indoor spaces, such as houses, schools, offices, and public buildings. These pollutants can come from both outdoor sources and indoor activities like cooking or cleaning (Kuban et al., 2018). This type of pollution can have complex causes and can contain various types of pollutants, including those that differ physically, chemically, and biologically. Household air pollution (HAP) arising from solid fuel use remains a global health threat. Nearly three billion of the world's population continues to rely on solid fuel, including biomass fuels (wood, animal dung, and crop waste) to meet their energy needs (1). These people are poor and live mainly in developing countries in Asia and Sub-Saharan Article (2).

2. HEALTH EFFECTS OF INDOOR AIR POLLUTION

According to the World Health Organization's "Guidelines for Air Quality," the main health effects of IAP include irritation, respiratory infections, and Sick Building Syndrome, among others.

Mainly women in developing countries are engaged in cooking activities. Their newborns and kids spend a substantial amount of time with them in the kitchen. Exposure to HAP may have impact on reproductive health of women, their newborns and kids. Previous epidemiological studies show association of HAP with a range of adverse health and birth outcomes among women (3) (4).

Different types of houses do not have an equal distribution of the measured levels of a number of factors. This might be explained by variations in home construction or the use of pollution sources. RUR, REN, and SLU dwelling types are associated with greater endotoxin-related health risks, while REN dwelling types are associated with higher CO₂, CO, and VOC-related health risks, and SLU is associated with higher PM 2.5-related health risks. Asthma, atopic dermatitis, and allergic rhinitis are only a few of the pulmonary and allergic conditions that are linked to inhaled air pollution. Additionally, smoking activity is considered to be one of the key contributors to the emergence of chronic inflammatory pulmonary disorders, such as lung cancer, asthma, and chronic obstructive pulmonary disease (COPD) (5). It has been demonstrated that women, especially in developing countries, have a great risk for COPD because of exposure to household smoke from cooking (6).

Deaths from air pollution, including from HAP and ambient air pollution, far exceed deaths attributed to other environmental factors (table 1). (7)

Table 1. Deaths attributable to environmental risks worldwide:

Risks	Deaths in 2010 (95% CI)
Household air pollution	3.55 million (2.68 million to 3.62 million)
Ambient pollution	3.22 million (2.82 million to 3.62 million)
Occupational risk factors	0.85 million (0.66 million to 1.06 million)
Lead exposure	0.67 million (0.58 million to 0.78 million)
Second-hand smoke	0.60 million (0.45 million to 0.52 million)
Unimproved sanitation	0.24 million (0.01 million to 0.48 million)
Unimproved water source	0.12 million (0.01 million to 0.23 million)
Residential radon	0.10 million (0.01 million to 0.22 million)

3. LACK OF AWARENESS AND DATA

Despite the growing recognition of the importance of indoor air quality, there is still a lack of awareness among the general public and even within some industries. In the past, much of the focus has been on outdoor air pollution, with limited data and attention given to indoor air quality. Indoor working environments, in particular, have received relatively little attention when it comes to studying the health effects of indoor air pollution (Linares et al., 2012).

4. UNDERSTANDING INDOOR AIR POLLUTANTS

It is important to understand the different types of pollutants that can be found in indoor environments. Some of the major contributors to IAP include carbon dioxide emitted from human respiration, volatile organic compounds released from building materials and furniture, chemicals like formaldehyde, and particulate matter (Han & Shim, 2020). Exposure to these pollutants can occur through inhalation or direct contact with contaminated surfaces or materials. Additionally, there are microbial pollutants such as mold, bacteria, and viruses that can thrive in indoor environments and contribute to the health risks associated with indoor air pollution. Additionally, poor ventilation and a lack of air exchange can exacerbate the effects of indoor air pollution by allowing these pollutants to accumulate and linger in enclosed spaces, further increasing the risk to occupants' health. The health effects of indoor air pollution can be significant and wide-ranging. Moreover, indoor air pollution has been found to have neurological effects. Research suggests that prolonged exposure to indoor air pollutants can contribute to cognitive decline, impaired memory, and even mental health issues such as depression and anxiety. Furthermore, the World Health Organization has reported that indoor air pollution is responsible for approximately 4.3 million premature deaths each year (8).

5. EXAMINING COMMON INDOOR POLLUTANTS

Since individuals spend more than 90% of their time inside, the United States Environmental Protection Agency (USEPA) claims that interior air pollution is worse than ambient air pollution (9). The creation and demand for smart houses and villas have grown as a result of the expansion of metropolitan areas and technological advancement (10). Sick Building Syndrome (SBS) is a term used frequently to describe a collection of symptoms that are connected to the physical settings of particular buildings (11). These effects can be concentrated in a small area or pervasive over the entire building (12). Diseases Caused by Buildings (BRI) highlights ailments and symptoms that have a known cause that is directly connected to exposure to poor air quality inside buildings. Chemicals including formaldehyde, xylene, insecticides, and benzene are recognized to be causal factors, although biological agents are more common. Cooling

towers, humidification systems, filters, drain pans, wet surfaces and water-damaged building materials are common sources of indoor biological pollutant emissions in buildings (13).

6. THE RELATIONSHIP BETWEEN INDOOR AIR QUALITY AND HEALTH

“An analysis of Indoor air quality of improved biomass Cook stove: A way to reduce health hazards of kitchen worker” is a significant study which focuses on the adverse effects on the health as a consequence of the increasing and hazardous effects of indoor pollution.

IAP exposure has a considerable impact on the maximum amount of lung function that can be obtained; as a result, lung function declines. Beginning in prenatal, noxious particles, such as PM and CO, may affect lung development (14).

The WHO Global Health Observatory report updated the estimates and noted that HAP caused 4.3 million deaths worldwide in 2012 (15).

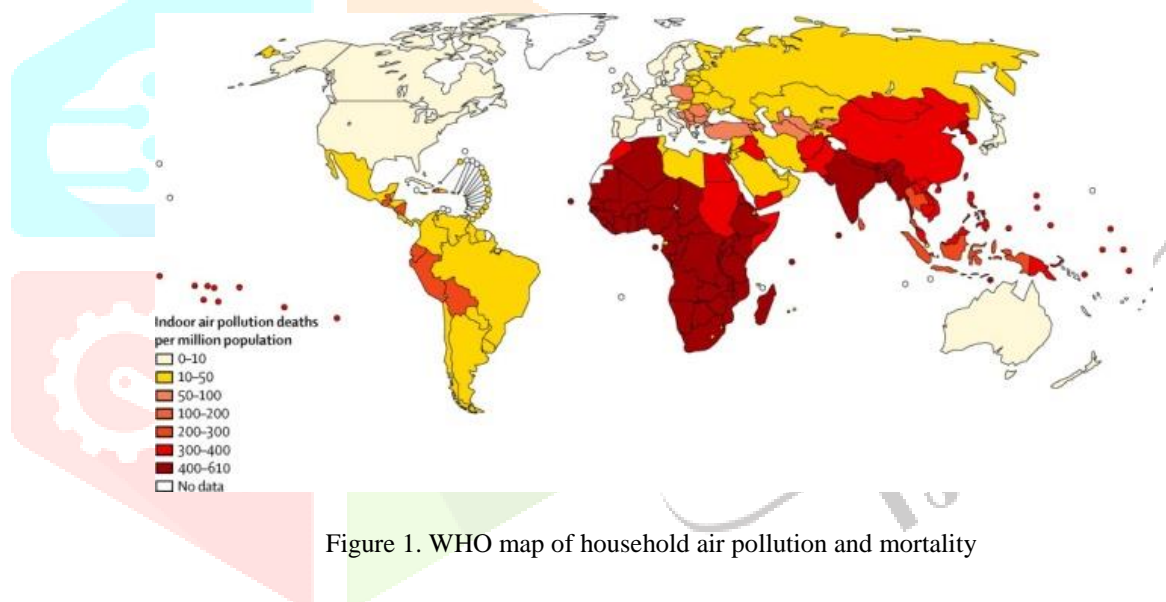


Figure 1. WHO map of household air pollution and mortality

7. CONCLUSION:

According to the different studies reviewed it is concluded that indoor air pollution is the upcoming threat to health that can affect our lives in different ways. It has some short term as well as long term effects. Some effects like irritation to nose, eyes, throat can occur even after the single exposure and if exposed on a long term it can lead to various respiratory disease, heart diseases and can be debilitating. IAP from solid fuel is one of the greatest global health threats that women and children are facing, who are involved in household work such as cooking collecting firewood.

In spite of these harmful effects there is still a lack of knowledge and understanding about indoor air pollution in the general population. There is no Strong policy developed so far which can check the use of clean fuels in household and according to WHO Without strong policy action, 2.1 billion people are estimated to still lack access to clean fuels and

technologies in 2030. So, some policies should be developed that ensures the use of clean fuels so that we can reduce the health threat from IAP.

Promoting the use of clean fuels and technologies is crucial to reducing indoor air pollution and protecting health. These include solar, electric, biogas, liquefied petroleum gas (LPG), gasoline, alcohol and biomass stoves that meet the goals of WHO guidelines.

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