



INDOOR AIR POLLUTION (IAP) EXPOSURE AND ITS IMPACT ON HEALTH

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Abstract-The environmental concern for air pollution has largely been focused on the question of pollution outdoors. The indoor air pollutants are nearly the same as that of the outdoor ones. However, in some instances the concentration of indoor pollutants exceeds the standard set for the outdoors. These pollutants reach such a high level although they are emitted in small volumes but they cannot escape easily from the buildings due to lack of proper ventilation. Indoor air pollution is more harmful and poses greater health hazards because on average a person spends nearly 16 to 18 hours indoors. The data from recent studies indicate that risk-wise, it ranks only below malnutrition and poor quality of water / sanitation. But, health hazards of housewives have been traditionally underestimated in the developing countries. It is considered as a social responsibility of the women. The work of housewives can be categorized as hazardous occupation as they might be exposed to volatile organic compounds and polycyclic aromatic hydrocarbons veryday. There are evidences that indoor air pollution may increase the risk of respiratory tract infections and lung cancer among housewives. Eventhough, the degree of this problem is identified; social scientists have only recently started to pay attention to this issue and to investigate plan for reducing IAP.

Keeping these points in mind, in this paper; we provide a survey of the accessible literature on the indoor air pollution and its impact on health.

Keywords- Indoor, Air, Pollution, Health, Impacts.

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Introduction

Most people take pride in keeping their homes clean and safe. Unfortunately, however, many of the indoor pollutants are not visible to the naked eye and often go ignored at cleaning time. In fact, the [1] estimates that the air indoors can be two to five times more polluted than the air outside. That's a pretty serious statistic considering that indoor air pollution has been linked to a host of health issues, including headaches, dry eyes, nasal congestion, nausea, fatigue and allergic reactions, as well as diseases such as asthma, chronic bronchitis and cancer.

Over three billion people worldwide are dependent on biomass fuels-crop waste, dung, wood, leaves etc. and coal to meet their energy requirements. Cooking and heating with such solid fuels

on open fires or stoves without chimneys leads to indoor air pollution. This indoor smoke contains a variety of health-damaging pollutants including small soot or dust particles that are able to enter deep into the lungs. In poorly ventilated dwellings, indoor smoke can exceed acceptable levels for small particles in outdoor air 100-fold. Exposure is particularly high among women and children, who spend the most time near the domestic hearth. Every year, indoor air pollution is responsible for the death of 1.6 million people - that is one death every 20 seconds [2].

The use of polluting fuels thus creates a major burden on the health of poor families in developing countries. The dependence on such fuels is both a cause and a result of poverty as poor households often do not have the resources to obtain cleaner,

more efficient fuels and appliances. Reliance on simple household fuels and appliances can compromise health and thus hold back economic development, creating a vicious cycle of poverty. In India 82% households at lower levels of income and development tend to be at the bottom of the, using fuel that is cheap and locally available but not very clean nor efficient. Also the use of the biomass fuels appears to be growing because of growing population and the non availability of, or increases in the price of, alternatives such as kerosene and liquid petroleum gas. Despite the magnitude of this growing problem, the health impacts of exposure to indoor air pollution have yet to become a central focus of research, development aid and policy-making

About 72.3% of households in India and 90% of the population in poorer, rural regions use traditional fuels. In response to perceived health threats from the traditional fuels, both the Indian government and many non-governmental organizations (NGOs) have implemented clean stove programs. During the 1980s and 1990s, the government of India alone subsidized and distributed 32 million improved stoves. However, there is little evidence on whether the stoves improve health, and if effective, how the stoves compare with other possible health interventions [3].

Indoor Air Pollution and Health

Health effects from indoor air pollutants may be experienced soon after exposure or, possibly, years later. Thus, both: the immediate and long term effects are explored

Immediate effects

Immediate effects may be noticed after a single exposure or repeated exposures. These include irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue. Such immediate effects are usually short-term and treatable. Sometimes the treatment is simple like reduce the person's contact to the source of the pollution, if it can be identified. Symptoms of some diseases, including asthma, hypersensitivity pneumonitis, and humidifier fever, may also occur soon after exposure to some indoor air pollutants.

The possibility of immediate reactions to indoor air pollutants depends on several factors but two most important are age and preexisting medical conditions. Also it will depend upon individual sensitivity, which varies from person to person. Some people can become sensitized to biological pollutants after repeated exposures, and some people can become chemical pollutants.

Certain immediate effects are similar to those from colds or other viral diseases, so it is often difficult to decide if the symptoms are a result of exposure to indoor air pollution. Therefore, it is important to take care of to the time and place symptoms are seen. If the symptoms weaken or go away when a person is away from building, for example, an effort should be made to identify indoor air sources that may be possible causes. Some effects may be made worse by an inadequate supply of outdoor air or from the heating, cooling, or humidity conditions prevalent in the building.

Long-term effects

Other health effects may be cumulative and occurs only after long or repeated periods of exposure. These effects include some respiratory diseases, heart disease, and cancer that can be severely disturbing or fatal. Thus, it is important to try to improve the indoor air quality in the building even if symptoms are not noticeable.

Evidence on the Effect of Indoor Air Pollution on Health

As women are primarily responsible for cooking, and as children often spend time with their mothers while they are engaged in cooking activities, women and young children are disproportionately affected. For example, the [1] estimates that acute respiratory infection (ARI) is one of the leading causes of child mortality in the world, accounting for up to 20% of fatalities among children under five, almost all of them in developing countries (IAP is thought to cause about one-third of ARI cases). This makes solid fuels the second most important environmental cause of disease after contaminated waterborne diseases and the fourth most important cause of overall excess mortality in developing countries after malnutrition, unsafe sex, and waterborne diseases [4]. In addition to impacts on mortality, IAP may have long lasting effects on general health and well-being: early exposure to IAP during childhood may stifle lung development, suggesting that the cost of this pollution may continue later in life. In fact, a growing literature indicates that environmental insults at early ages can have long lasting influences on human health and productivity [5]. Numerous studies have found associations between IAP and acute lower respiratory infection [6], chronic obstructive pulmonary disease [2, 7] lung cancer in the case of coal smoke [8-9] There is emerging evidence that IAP increases the risk of other child and adult health problems, including low birth-weight, parental mortality, asthma, otitis media (or middle ear infection), tuberculosis, nasopharyngeal cancer, cataracts, blindness, and cardiovascular disease [2].

According to the 2002 World Health Report, indoor air pollution from combustion of solid fuels for cooking and space heating are one of the eight most important risk factors in global burden of disease (measured as disability adjusted life years [DALY]). It accounts for an estimated 2.7% of the global disease burden and some 1.6 million premature deaths annually [2]. In poor developing countries, indoor smoke from solid fuels ranks fourth, behind only under-nutrition, and unsafe water/sanitation /hygiene, unsafe sex, accounting for an estimated 3.7% of the disease burden. Urban air pollution additionally causes 1.4% of premature deaths and 0.8% of the global disease burden [7] have reviewed the epidemiological evidence for the health effects of indoor smoke from solid fuels. The authors concluded that despite the limitations of methodology, the combination of epidemiological studies as well as experimental evidence and pathogenesis provide compelling evidence of causality for acute respiratory infections and chronic obstructive pulmonary disease, particularly in conjunction with findings for environmental tobacco smoke and ambient air pollution. The relationship between coal smoke (but not biomass) and lung cancer has also been consistently established in a number of epidemiological studies [10-13]. For other health outcomes, including asthma, upper aerodigestive cancer, interstitial lung disease, low birth weight, parental mortality, tuberculosis, and eye diseases. The details of biological mechanisms and epidemiological studies on indoor air pollution and childhood ARI were reviewed by [7] who concluded that "when interpreted in the broad framework of epidemiological and toxicological evidence on inhaled pollutants and ARI, the association of smoke from biomass fuels with ARI should be considered as causal, although the quantitative risk has not been fully characterized". [14] Standard for an acceptable annual 24-hour average of PM₁₀ is 150µg/m³, and they state that this level should not be exceeded more than once per year. In

fact, $50\mu\text{g}/\text{m}^3$ is the accepted norm for PM_{10} [14]. In contrast, [10] reports that mean 24-hour PM_{10} concentration in solid-fuel-using households in India sometimes exceed $2000\mu\text{g}/\text{m}^3$. Similarly, a study of about 400 households in the provinces of Shaanxi, Hubei, and Zhejiang, China, were monitored for PM_{4} , and it was found that most households exceed China's Indoor Air Quality Standards [15]. The concentration effects also depends upon exposure may also vary with an individual's closeness to the stove during periods when the stove is in use. [16, 17] and have found similar results in India, with reported levels of $20,000\mu\text{g}/\text{m}^3$ or more near the cooking location and with much lower concentrations of these toxins in the rest of the kitchen/other rooms in the household. In Bangladesh, [18] find that, within the household, women who cook exhibit greater symptoms of respiratory illness, as do the young children whom they supervise. They also find that the women who cook tend to be the women with the worst health endowments. They conclude that the household "shares" the burden of disease in an optimal way.

Conclusion

Indoor air pollution is a major environmental and public health hazard for many of the world's poorest, most vulnerable people. However, current evidence is based on a limited number of studies, few of which have measured smoke exposure directly. It is therefore, important to emphasize both the amount and quality of this information to support, to plan prevention programmes for specific settings and to encourage the health sector to contribute more actively to multi-sectoral action.

Further, research should pay attention to the valid quantification of exposure. There are number of health problems for which the available evidence is very limited or conflicting. For these, well-conducted studies may be taken up. Efforts should also be made to support emerging exposure-response relationships, particularly for common and serious health outcomes such as acute lower respiratory infections.

Also awareness campaign for rural areas will raise the knowledge level and encourage people to look for substitute and cleaner cooking fuel. The traditional activities and practices are slow to change; the awareness enhancement should be planned at multiple levels: stress on better ventilation; making available greencooking energy options; encouraging adoption of energy-efficient cooking methods and utensils to trigger a move towards cooking without smoke. Thus, it is important to promote the benefits of conserving energy by adopting such 'clean' technologies through public awareness campaigns. It will take collective will and consistent work to make a difference.

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