National Journal of Advanced Research
ISSN: 2455-216X; Impact Factor: RJIF 5.12
Received: 25-03-2020; Accepted: 15-04-2020; Published: 26-04-2020
www.allnationaljournal.com
Volume 6; Issue 2; 2020; Page No. 01-03

Social and health implications of household air pollution

Sandesh KS[1], Nishanth Gowda N[2], Mangala SM[3]
[1] Head, Department of PG Studies, Nehru Memorial College, Sullia, Karnataka, India
[2] Physiotherapist, Trauma & Emergency care centere, Victoria Campus Bangalore, Karnataka, India
[3] Institute of Development Studies, University of Mysore, Mysuru, Karnataka, India

Abstract
The global impact of household air pollution has resulted in a high prevalence of morbidity and mortality from respiratory diseases. The following systematic review sort to analyze the association between respiratory illnesses and the relevant exposure from different research already carried out. The articles studied had varying research methodologies. The highest-ranking was randomized clinical trials. The review found that pneumonia, tuberculosis, chronic obstructive airway disease, and lung cancer were positively associated with air pollution in the household. Lung cancer and fibrotic lung disease had a direct causal relationship with PAH and Nitrogen Dioxide. The social implications were high prevalence and morbidity among vulnerable groups that should be addressed through public health policy and education.

Keywords: global, prevalence, policy, education

Introduction
Household air pollution is the contamination of the proximal environment by microparticles derived from domestically used substances. Household air pollution can be caused by chemical substances, physical or biological substances (Apte 34). The most common source of household air pollution is from combustion products that produce carbon-based microparticles, carbon (II) oxide, and other chemical derivatives. Lower socioeconomic households are more predisposed to agents of air pollution. These households are more likely to use charcoal, firewood or animal residue as fuel leading to the release of potentially harmful agents.

Other domestic sources such as pest and insect control, roofing materials, smoking, and biological contaminations also majorly affect lower socioeconomic status households. In such households, sewerage and housing units may favor pest and insect infestation causing a need for insecticide use. Insecticides contain organophosphates that are potentially mutagenic. Psychological stress predisposes those in lower socioeconomic households to smoking. Additionally, damp areas are likely to develop fungi such as Aspergillus that release spores contaminating the air. Roofing materials such as asbestos predispose the occupants to fibrotic lung disease and carcinomas over long term exposure (Kumar 477).

The World Health Organization people worldwide die prematurely from an illness that can be attributed to household pollution from fuel combustion. Pneumonia was the most prevalent cause, chronic obstructive airway disease, stroke, tuberculosis, nasopharyngeal and lung cancer, and ischemic heart disease followed closely. An association of low birth weight by expectant mothers was made. In addition to the cost of health, social costs are also incurred. The social cost can be divided into direct costs and indirect costs. The direct costs include paying for healthcare the burden is felt more among those who have to pay out of pocket. Indirect costs such as potential labor are lost in the event of death.

Methodology
The review involved obtaining data on pneumonia, chronic obstructive disease, tuberculosis, asthma and lung cancer and whether there is an association with household air pollution. To achieve the objectives an extensive literature was studied. This included peer review articles, medical textbooks, bibliography from review articles and information sources from relevant public health organization databases such as the World Health Organization, Centre for Disease Control and the National Institute of Health.

In performing the article search keywords used were “chronic obstructive pulmonary disease”, “pneumonia”, “tuberculosis”, “lung cancer” and “asthma”. They were separately associated with either one or all of these other keywords: “household air pollution”, “public health”, “prevalence” and “socioeconomic status”. The results were passed through the inclusion-exclusion criteria. The databases searched were PubMed, Google Scholar, Science Direct and Nature Reviews. The included articles were peer-reviewed while articles were excluded based on the date of publication. Any article published before 2009 were excluded.

Results
Chronic Obstructive Airway Disease
Chronic obstructive airway disease is a pulmonary illness that is characterized by reduced airflow intake due to obstruction at any level of the respiratory tract. Clinically it is characterized by a decrease in the forced expiratory volume. In chronic bronchitis, respiratory obstruction is characterized by excessive mucous production. More commonly the hypersecretion is induced by excessive cigarette smoking but studies have shown that other air pollutants have a similar effect (Kumar 468). In one study, of the 38% exposed to air pollutants, approximately 9 % developed COPD. Those exposed were 41 % more likely to develop COPD than the non-exposed group (Siddharthan

615). In another study,83% of COPD patients were non-smokers (Argawal 3802).

Asthma

Asthma is an obstructive pulmonary disease characterized by an immune response to an allergen. The pathophysiology involves the reversible narrowing of respiratory tracts through mucous secretion and hypertrophy of the bronchial muscles (Kumar 469). Allergens that induce the immune response are commonly found in the environment. In one study, the household pollutant being assessed was wood smoke. Those exposed to household pollutants were more likely to experience more severe asthmatic attacks and poorer spirometry results such as a decreased FEV/FVC ratio (Fernandes 5).

Pneumonia

Pneumonia is a lung disease characterized by inflammation of the alveoli. I t can be caused by a viral, bacterial infection or aspiration of foreign particles. Pneumonia is a significant cause of under 5 mortality causing approximately 1.4 million deaths annually (WHO). Among the leading risk factors is household air pollution. In one survey, they found that the prevalence of childhood pneumonia was higher by 1 to 2% higher in those exposed to combustion fuel products. The measures of association used in the study determined that 39% of childhood pneumonia cases were attributed to the use of polluting cooking fuels (Budhathoki 452)

In another study, a randomized trial was done to study the intervention of using clean fuels, in particular, liquefied petroleum gas. The study concluded that there was a significant occurrence of bacterial but not viral pneumonia in the control group in comparison to the intervention group (Lee A5976). In ethical consideration, the control groups were also provided with LPG at the end of the study.

Lung Cancer

Lung cancer is the abnormal growth of cells in pulmonary tissue. The pathophysiology involves genetic mutation causing loss of tumor suppressor genes or activation of proto-oncogenes. This causes an unchecked growth of non-functional cells (Kumar 477). It is the leading cause of cancer mortality worldwide. The highest risk factor is cigarette smoking however other contaminants such as asbestos may lead to neoplastic variants such as mesothelioma.

While the contribution of smoking to the occurrence of lung cancer has already been determined there is still a paucity of data in regards to household air pollution. A study was one to determine what the association was between lung cancer and household pollution by observing the occurrence of lung cancer in women who do not smoke. Among those exposed to smoky coal the combustion products that were highly associated with lung cancer were ploy cyclical aromatic hydrocarbons and nitrogen dioxide (Vermeulen 4)

Tuberculosis

Tuberculosis is commonly considered chronic pneumonia caused by an autoimmune reaction to *Mycobacterium tuberculosis* that usually involves pulmonary tissue but can involve any other organ. The prevalence of tuberculosis is rising especially in low socioeconomic countries due to the burden of HIV/AIDs. Approximately 1.5 million people died from TB infection in 2018 (WHO). In one study the use of dirty fuels compared to clean fuels showed a positive association with the occurrence of pulmonary tuberculosis. The data was adjusted for confounders such as age, sex, HIV status, and TB contact. However, the association was found to be non-significant (Nkosana 4).

Discussion

The review determined that the diseases commonly associated with household air pollution were pneumonia and other upper respiratory infections, chronic obstructive pulmonary disease focusing on bronchitis and asthma, lung cancer and pulmonary tuberculosis. While there were positive associations between the exposure to household pollutants and disease occurrence most was non-significant statistically. However, fibrotic lung disease and lung cancer had a direct causality relationship with asbestos exposure and polycyclic aromatic hydrocarbons respectively.

Asthma, bronchitis and other diseases caused by infectious agents did not have a direct causality to household air pollution. However, the risk of disease occurrence, severity and prognosis were all affected by exposure to household air pollution. The most common source of household air pollution was harmful products of fuel combustion. It was majorly associated with those of lower socioeconomic status. Healthcare workers and public policy should, therefore, adjust to protect the most vulnerable groups especially children under 5.

The social impact of household air pollution seems to affect the most vulnerable groups in society such as pregnant women and children. Public policy should, therefore, be put in place to offer better solutions to charcoal and firewood as sources of cooking fuel. Additionally, health education by health workers in the community can improve the likelihood of exposure.

References

1. Agarwal A, Kadam S, Brahme A, Agrawal M, Apte K, Narke G, *et al*. "Systemic Immunometabolism in Asthmatics and Biomass or Tobacco Smoke Exposed Chronic Obstructive Pulmonary Disease (COPD) Patients." In B62. ASTHMA MECHANISMS, pp. A3802-A3802. American Thoracic Society, 2019.
2. Ahmed Fahad, Sahadat Hossain, Shakhaoat Hossain, Abu Naieum Muhammad Fakhruddin, Abu Tareq Mohammad Abdullah, Muhammed Alamgir Zaman Chowdhury, & Siew Hua Gan. "Impact of household air pollution on human health: source identification and systematic management approach." *SN Applied Sciences*. 2019; 5(5):418.
3. Apte Komalkirti, Sundeep Salvi. "Household air pollution and its effects on health." *F1000Research* 5, 2016.
4. Budhathoki, Shyam Sundar, Bhim Singh Tinkari, Amit Bhandari, Meghnath Dhimal, Hong Zhou, Anup Ghimire, Omkar Basnet, Johan Wrammert, & K. C. Ashish. "The association of childhood pneumonia with household air pollution in Nepal: Evidence from Nepal demographic health surveys." Maternal and Child Health Journal, 2020, 1-9.
5. Emuron, Dennis, Trishul Siddharthan, Brooks Morgan, Suzanne L. Pollard, Matthew R. Grigsby, Dina Goodman, & Muhammad Chowdhury. "Lack of an Association Between Household Air Pollution Exposure and Previous Pulmonary Tuberculosis." *Lung*.

2019; 197(6):793-801.
6. Fernandes Andréia Guedes Oliva, Carolina de Souza-Machado, Gabriela Pimentel Pinheiro, Sergio Telles de Oliva, Raquel Cristina Lins Mota, Valmar Bião de Lima, Constança Sampaio Cruz, José Miguel Chatkin, & Álvaro A. Cruz. "Dual exposure to smoking and household air pollution is associated with an increased risk of severe asthma in adults in Brazil." *Clinical and translational allergy*. 2018; 8(1):48.
7. Jafta Nkosana, Prakash M Jeena, Lars Barregard, Rajen N Naidoo. "Association of childhood pulmonary tuberculosis with exposure to indoor air pollution: a case control study." BMC public health. 2019; 19(1):275.
8. Kumar V, Abbas AK, Aster JC. "Robbins basic pathology e-book: Elsevier Health Sciences, 2017.
9. Lee Alison, Darby Jack, Seth Owusu-Agyei, Blair Wylie, Steven N Chillrud, Robin Whyatt, *et al*. "Clean Cookstove Household Air Pollution Intervention Decreases The Risk For Bacterial Pneumonia But Not Viral Pneumonia." In *C60. Indoor Air Pollutants: Biomass and Wood Smoke*, pp. A5976-A5976. American Thoracic Society, 2017.
10. Ranathunga Nayomi, Priyantha Perera, Sumal Nandasena, Nalini Sathiakumar, Anuradhani Kasturiratne, Rajitha Wickremasinghe, *et al*. "Effect of household air pollution due to solid fuel combustion on childhood respiratory diseases in a semi urban population in Sri Lanka." BMC pediatrics. 2019; 1(1):306.
11. Raspanti Greg A, Mia Hashibe, Bhola Siwakoti, Mei Wei, Binay Kumar Thakur, Chin Bahadur Pun, Mohammed Al-Temimi, Yuan-Chin Amy Lee, & Amir Sapkota. "Household air pollution and lung cancer risk among never-smokers in Nepal." Environmental research. 2016; 147:141-145.
12. Rice Mary B, Sheryl L Rifas-Shiman, Augusto A Litonjua, Matthew W Gillman, Nicole Liebman, Itai Kloog, *et al*. "Lifetime air pollution exposure and asthma in a pediatric birth cohort." Journal of Allergy and Clinical Immunology. 2018; 141(5):1932-1934.
13. Siddharthan Trishul, Matthew R Grigsby, Dina Goodman, Muhammad Chowdhury, Adolfo Rubinstein, Vilma Irazola, Laura Gutierrez. "Association between household air pollution exposure and chronic obstructive pulmonary disease outcomes in 13 low-and middle-income country settings." American journal of respiratory and critical care medicine. 2018; 197(5):611-620.
14. Simkovich Suzanne M, Dina Goodman, Christian Roa, Mary E Crocker, Gonzalo E Gianella, Bruce J Kirenga, *et al*. Robert A. Wise, & William Checkley. "The health and social implications of household air pollution and respiratory diseases." NPJ primary care respiratory medicine. 2019; 29(1):1-17.
15. Vermeulen R, Downward GS, Zhang J, Hu W, Portengen L, Bassig BA, *et al*. Constituents of Household Air Pollution and Risk of Lung Cancer among Never-Smoking Women in Xuanwei and Fuyuan, China. Environmental health perspectives. 2019; 127(9):097001.
16. Yin P, Cai Y, Liu JM, Liu YN, Qi JL, Wang LJ, *et al*. "Disease burden attributable to household air pollution in 1990 and 2013 in China." *Zhonghua yu fang yi xue za zhi* [Chinese journal of preventive medicine]. 2017; 51(1):53-57.