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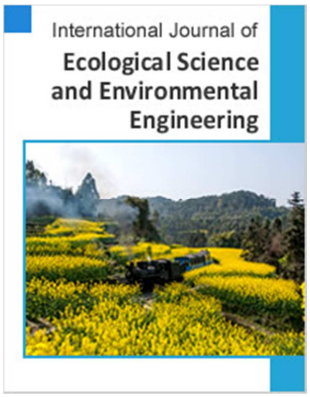

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Indoor Particulate Matter and Its Characteristics Challenging for Environmental Remediation

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Abstract
The release of inefficient stoves and solid fuels for heating and cooking is a clause of approximately 4 million premature deaths yearly. The cooking with biomass is very common, little information regarding kitchen characteristics and challenging on human health issue and an understanding of the effect and interaction of i.e. tobacco smoke in home as well as in offices is achieved. In many parts of our country the level of SO_x, NO_x,NH_3 are becoming public health issue. As increasing investment are made to tackle this important public health issue, there is need for identifying and providing guidance on best practice for stove and exposure performance monitoring, particularly for health issue and evaluation studies. This review article includesdiscussion on indoor particulate matter pollution, different ways of sampling and their characteristics challenging. The material collected from different research paper published in various journals and from government reports.

1. Introduction

Air pollution causes over 4 million deaths in each year [1]. Economical problem is responsible of all these death which make household one of the leading risk factor for health on a global scale[1]. Exposure to traffic related air pollutants are associated with excess mortality [2, 3]. The burden of air pollution from traffic on morbidity is also well documented with the variety of negative respiratory [4], cardiovascular [5] and reproductive effect [6] and lung cancer [7]. In 1930, SO_2 from local factory emission mixed with a dense fog over the meuse valley in Belgium. Over 3 days, several thousand people were stricken with acute pulmonary symptoms, and 60 people died from cause of respiratory [8].In December 1952, a smog containing smoke particulate and SO_2 resulting in more than 3,000 excess death in 3 weeks and as many as 12,000 through February 1953 [9]. While considering the indoor particulate matter the air pollution is responsible for many type of diseases like acute lower respiratory infections and chronic obstructive pulmonary disease [10]. The Denver study's limited data suggested that pollutant removal might effect the quality of the indoor atmosphere as well as minimize the potential for sink or reservoir to become pollutant source [11]. Fine particles with diameter <2.5 μm (PM 2.5) are of serious health concern because when it is inhaled they

can deeply deposited in the lungs [12]. Human spends most of their lives indoor. So evaluation of their health risk by air pollutant requires a detailed understanding of indoor particulate matter. The global burden of diseases are acute respiratory infections [13, 14], and it leads to 6% of worldwide diseases and mortality. Exposure to indoor air pollution, especially to particulate matter from combustion of biofuels (wood, charcoal, agriculture residue) has been associated with respiratory disease in developing countries [15]. The growing public awareness and the risk associated with indoor air quality in the home and workplace the indoor PM has greater effect of respiratory irritants, toxicants, and adjuvants or carrier of allergens. Because American spend approximately 22 hour everyday indoor, they have greater risk of health effect. Along with particulate matter, gases such as ozone, nitrogen dioxide, carbon monoxide and sulphur dioxide, passive smoke is most common type of air pollutant encountered indoors [16]. Particulate matter has detrimental effect on health especially for those with asthma. This PM source are smoking, cooking and cleaning activities [17, 18]. Increasing in PM has greater morbidity in asthma and greater mortality in population [19-22].

2. Literature and Discussion

The study took place in various foreign cities of different countries like one of study took place at Mpala Ranch and research centre, in Laikipia district, central Kenya. Cattle heirding and domestic labour are their main occupation. Firewood and charcoal were the main fuels used by all the household on the ranch. Stroves were unvented, and burnt firewood or charcoal. This research is approve by the institutional review panel for human subject of the university research board, princton university, USA (case no 1890) and by the government of Kenya, under the office of the president research permit no OP/13/001/25C 167. The research of Mpala Ranch from 1996 to 1999 including background data including all the households and survey of energy use, energy technology, diet, and smoking. The monitoring of indoor particulate matter of PM_{10}, And CO in 55 houses [23].One study took place in Nouna, located in the Kossi province in northwest Burkina Faso. Nouna was chosen as the site for this study as biomass solid fuel is very high (>95%; WHO 2006 a). The large of use of biomass result in the produced smoke can cause risk of malaria among women (15-45 years) and children (<10 years) [24]. Indoor monitoring of fractionating particles was conducted in the cities of Fuji and Shimizu. A total of 88 houses in industrial residential and commercials areas were sampled. Indoor air sample of 24-h duration were collected simultaneously. Inside the homes, sampling equipment was placed in the main living area. Which shows that a no of polyaromatic hydrocarbon were present which produce the risk of carcinogenic [25]. Suspended PM of PM_{10}, indoor dust and asbestos fiber samples were collected from the different laboratories located in university of Kebangsaan Malaysia, during the sampling it's very hot weathering and temperature range is 28°C-32°C and humidity range is 52.23% and 83.63%. This sample is analyzed by using inductively coupled plasma mass spectroscopy which shows that the composition of heavy metals and airborne fibers in the indoor environment of a building during renovation [26]. Indoor particulate matter was measured in seven homes in Birmingham, UK, and two homes during a 12 month period. Then it can analyzed in instrument TEOM and it can provide real time data for PM_{10}, $PM_{2.5}$, PM_1 mass conc. TEOM result were used in conjunction with information to identify the source of episodic elevated particles concentration within the home. The indoor sources such as cooking, smoking and cleaning contributed substantially to indoor concentration of PM_{10} and were the dominant source of episodic peaks in PM_{10}. The major source of $PM_{2.5}$ and PM_1 are the cooking and smoking while cleaning and general activity has little effect on concentration within this size range [27]. Diagnostic techniques used for indoor air quality are of qualitative and quantitative. The qualitative investigation includes visual observation. Direct reading instrument used to measure humidity, room temperature, and particulate concentration [27].

Table 1. *Indoor air levels of $PM_{2.5}$ and PM_{10} in rural homes during cooking on different biomass fuels.*

Home noNature of biomass used for cooking		Concentration during cooking period (mg/m^3)		Concentration during non-cooking period (mg/m^3)	
		PM2.5	**PM10**	**PM2.5**	**PM10**
1	Plant materiala	1.46	5.26	0.22	0.71
2	Plant material	0.88	2.85	0.26	0.68
3	Plant material	1.25	3.76	0.21	0.63
Mean ±SD (n=3)		1.19±0.29	3.95±1.21	0.23±0.03	0.67±0.04
4	Plant material+cattle dung cakes	2.26	8.77	0.29	0.65
5	Plant material+cattle dung cakes	2.63	8.48	0.28	0.77
6	Plant material+cattle dung cakes	2.19	7.46	0.24	0.64
7	Plant material+cattle dung cakes	1.97	7.24	0.25	0.65
8	Plant material+cattle dung cakes	2.85	8.99	0.25	0.66
Mean ± SD (n=5)		2.38±0.35	8.18±0.78	0.26±0.02	0.67±0.05

[a] Wood, Leaves,twigs, crop residues

This shows that increased exposure to indoor PM_{10} increase the frequency of acute respiratory infections [27]. The survey is conducted and an estimated 37.2% of household was dependent on wood and plant materials for

domestic cooking and 62.8% used in addition cattle dunk cakes. During the cooking by using biomass produced lot of smokes, damaging for family members indoor. Indoor particulate matter was assessed on the basis of respirable PM and associated polyaromatic hydrocarbon prevailing during and before cooking in both domestic cooking and cattle dunk cakes [27] (Table 1).

Table 2. *Demoghraphic information for individuals from the 55 study households, and mean SD number of health reports [16].*

Type	Age group* (years)				Total(n=345)
	<5(n=93)	5-14(n=109)	15-49(n=120)	≥50(n=23)	
Girls/women	52	61	65	15	193
Mean (SD) age at the end of study	3.0(1.4)	9.7(2.7)	29.4(10.0)	63.8(9.4)	18.3(17.6)
Mean (SD) health reports	72.2(23.9)	82.2(16.3)	80.5(17.7)	73.9(19.1)	78.4(19.7)

*We choose these age devisions because: children <5 years are most susceptible to acute respiratory infections; people ≥50 years begin to show chronic conditions; and people usually start work or marry at age 15 years. From early 1997, to june. 1999.

3. Conclusion

In evaluating the literature there is to be small but consistent and frequent effect of PM on human health. Overall the small effect can leads towards a larger one. Notably the effect is most pronounced for cardiovascular disease and its leads to cardiovascular mortality and hospitalization. More study is needed for interpretation of such relationships. Indoor kitchens, homes and burning of wood charcoal stoves, and tobacco smoking in or near the house produced strong health issues. Indoor air concentration of size dependent PM and its associated polyaromatic hydrocarbon was determined, seasonal variation was observed in polyaromatic hydrocarbon concentration elevating in winter. The risk associated with the inhalation of particulate polyaromatic hydrocarbon indoor shows that increase the risk of total carcinogenic potential was dominant in the range of 51% to 64%. Human activity pattern shows that people tend to append 90% or more than their time indoor. The concentration of particulate matter specially PM_{10} in the indoor environment during the renovation in the building can cause problem to human health. The source of indoor particulate matter are demolition process, grilling, dry sanding, cutting and painting had contributed to the generation of indoor dust which cause health effect. Although there is enough literature is available in this context and is truly impressive but the actual background and there assessment and improvement in this paraphrase are still vague.

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