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IMPACT ASSESSMENT OF INDOOR AIR POLLUTION DUE TO SUSPENDED PARTICULATE MATTER IN INDIAN KITCHENS

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ABSTRACT

Most people spend a large of their time indoors, which makes indoor spaces important microenvironments when addressing risks from air pollution. Most of a person's daily exposure to many air pollutants comes through inhalation of indoor air, both because of the amount of time spent indoors and because of the higher pollution levels indoors. The air quality inside buildings is affected by many factors. Indoor concentrations of air pollutants are influenced by outdoor levels, indoor sources, the rate of exchange between indoor and outdoor air, and the characteristics and furnishings of buildings. Indoor concentrations of air pollutants are subject to geographical, seasonal and diurnal variations. In Indian context, housewives, elderly people and children are more susceptible to indoor air pollution as they remain in house for most of the time. The health effects of particulates are strongly linked to particle size. Small particles, such as those from fossil fuel combustion, are likely to be most dangerous, because they can be inhaled deeply into the lungs, settling in areas where the body's natural clearance mechanisms can't remove them. The constituents in small particulates also tend to be more chemically active and may be acidic as well and therefore more damaging. A study of 60 kitchens was conducted in typical Indian kitchens at Kota to assess the impacts of suspended particulate matter. This study shows that above 70% of housewiveswere found to be

complaining one kind of symptoms or the other. This is owing to the exposure in high SPM concentration in environment.

INTRODUCTION

The subject of indoor air pollution has received a great deal of attention in recent years. Although most of the concern originally focused on the workplace, more people are looking for answers to health and comfort problems occurring in their homes. Most people spend a large of their time indoors, which makes indoor spaces important microenvironments when addressing risks from air pollution. Most of a person's daily exposure to many air pollutants comes through inhalation of indoor air, both because of the amount of time spent indoors and because of the higher pollution levels indoors. The air quality inside buildings is affected by many factors. Indoor concentrations of air pollutants are influenced by outdoor levels, indoor sources, the rate of exchange between indoor and outdoor air, and the characteristics and furnishings of buildings. Indoor concentrations of air pollutants are subject to geographical, seasonal and diurnal variations. In Indian context, housewives, elderly people and children are more susceptible to indoor air pollution as they remain in house for most of the time. In recent years, the problem of indoor air pollution in residential buildings has come into sharper focus.

Air quality in buildings in developing countries can have similar problems to those found in developed countries, particularly in the large modern urban areas in developing countries. There can be significant and widespread indoor exposures to many of the classical air pollutants, specifically sulphur dioxide, particulate matter, carbon monoxide, and nitrogen dioxide, in developing countries. A particular issue for developing countries is exposure to emissions from cooking and heating which may produce the highest air pollution exposures to many pollutants.

The single most important factor in indoor air quality is the intensity of the pollutant source. The greater the "source strength," the greater the potential for unhealthy air in the home. The source strength depends on both the quantity of a pollutant present and the rate emitted into the indoor air. The first priority in controlling a pollutant is to remove the source or reduce its strength. The best solution would be to replace a polluting source with an alternative non-polluting product.

Sampling site

A study was conducted to assess the impacts of suspended particulate matter in the Indian kitchens. The mostly occupied place by housewives is kitchen and thus sampling was carried out in kitchen.

For this purpose sixty residences were chosen at Kota which had different sizes of kitchen. The different sizes of kitchen were also indicative of the fact that they belonged to persons with different socio-economic status of living. The houses were also selected by considering their location. Further, these kitchens were selected on the basis of location of the houses. 16 kitchens were selected in old city, 12 kitchens were studied around the outskirts of the city and remaining 32 kitchens were located in new city area

Sampling Schedule

In a typical Indian kitchen, two major meals are cooked, one in the morning/noon hours and one in the evening/night hours. For each meal, approximately on an average, an Indian housewife spends 1-3 hours inside the kitchen inclusive of pre and post food preparation activities. Almost for 50% of this time gas stove burners are switched on i.e. combustion takes place. Based on all these facts, samplers were kept in each kitchen for at least two hours and during at least one major meal preparation time. A particular kitchen was monitored after taking into account the conditions that prevailed at the day and time of monitoring.

To find out the variations and concentrations of indoor air pollutants in kitchen in the different seasons of a year, it was decided to monitor the indoor air quality in all the kitchens in every season. The year's duration is divided basically into three seasons namely winter (October, November, December, January); summer (February, March, April, May, June); rainy (July, August, September).

Analysis of Observations

KOTA CITY	SPM (ìg/m^3)		
OLD CITY	S	W	R
Average	233	246	235
Maximum	265	280	260
Minimum	195	230	200
OUTSKIRTS			
Average	199	212	204
Maximum	210	222	230
Minimum	189	198	192
NEW CITY			
Average	222	234	226
Maximum	240	251	250
Minimum	189	208	200

The maximum level of SPM was found to be 280 µg/m^3 as compared with the WHO standards of 200 µg/m^3. The SPM was found to be high in almost all the kitchens.

It is also observed that the concentration of SPM is higher in winter season as compared with summer and rainy seasons.

It is also observed that the concentration of SPM is highest in the kitchens located in old city area and its concentration is lowest around outskirts of the city.

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RESULTS AND DISCUSSION

The results indicate that there is an alarming need to control the concentration of suspended particulate matter in the kitchen, as the observed concentrations are higher than the prescribed limits of WHO. The following conclusions were drawn on the basis of study :

The concentrations of SPM measured in most of the kitchens are higher than the permissible limits of WHO, in old city, outskirts and new city area and in summer, winter and rainy seasons.

The concentrations of SPM are higher in winter season. This is due to the reason that in winter the windows are kept closed for most of the time and due to lack of proper ventilation the particulate matter remain inside the kitchen.

The concentrations of SPM are higher in old city areas whereas concentrations of RSPM are higher in outskirts of the city.

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