



RESEARCH ARTICLE

PREVALENCE OF RESPIRATORY SYMPTOMS AMONG NON-SMOKING WOMEN USING BIOMASS FUELS FOR COOKING IN SONATTI VILLAGE, BELAGAVI

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ABSTRACT

Exposure to indoor air pollution from the combustion of biomass fuels (wood, charcoal, animal dung and crop wastes) and coal is a significant public health hazard predominantly affecting poor rural and urban communities in developing countries. A cross-sectional study was conducted in Sonatti village of Belagavi district among non-smoking women aged 20 years and above using biomass fuels for cooking. Interview was done using a pretested questionnaire. Observations were made on housing characteristics especially about kitchen and the cooking stove. The respiratory symptoms included cough (19.68%), phlegm (12.5%), breathlessness (9.37%), wheezing (0.31%) and chest illness (0.31%). 96% of the subjects cooked in kitchens which lacked a chimney and 95% of the subjects used kitchens which lacked even a single window. The overall prevalence of respiratory symptoms came out to be 20.31%.

Key words:

Biomass fuel, Prevalence,
Respiratory symptoms, Women

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INTRODUCTION

It is estimated that up to one-half of the world's population burns biomass fuel (i.e., wood, crop residues, animal dung and coal) for indoor uses such as cooking, lighting, and heating. As a result, a large proportion of women and children are exposed to high levels of household air pollution ([World Health Organization, 2009](#)).

About half of the world's households still use unprocessed solid fuels, ranging near zero in developed countries to more than 80% in the countries such as China, India and Sub-Saharan Africa ([Torres-Duque C *et al.*, 2008](#)). Burning of biomass fuel has emerged as one of the top ten global threats to public health as it accounts for 2.7 % of the global burden of disease. The levels of exposure to polluted air is reported to be higher in women and children since they spent most of their time indoors during cooking ([Khalequzzaman M *et al.*, 2010](#)).

India registers 600,000 premature deaths per year due to biomass fuel combustion exposure ([Revathi M *et al.*, 2012](#)). Fifty percent of the world's population and up to 90% of rural households in developing countries and approximately 80% of rural households in India still rely on unprocessed biomass

fuels such as wood, dung, crop residues and coal for production of domestic energy for cooking and heating. The biomass fuels when burnt in inefficient stoves and open fire places in closed space with no ventilation, forms an enormous source of indoor air pollution. Biomass fuels are used mostly by poor people; predominantly in rural areas of developing countries due to its easy availability and mostly free of cost when compared to other fuels (LPG, electricity, kerosene stoves). Biomass fuels have low efficiency and produce indoor air pollutants ([Bruce N *et al.*, 2000](#)).

Biomass combustion produces complex mixture of volatile organic compounds, which are respiratory irritants like: Suspended particulate matter of respirable size (PM<10 μ), carbon monoxide, nitrous oxides, SO₂, aldehydes (e.g. Formaldehyde) and poly aromatic hydrocarbons which are carcinogenic (e.g. Benzopyrene). PM10 has significant adverse effect on health. The mean PM10 level for 24 hours exposure is 300-3000 μg/m³ but as high as 30,000 μg/m³ during cooking is observed. The safety standard recommended for 24 hour average PM10 exposure is 150μg/m³. An average of PM10 levels is 1000 μg/m³ in India which is 10-70 times above the

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ambient levels in most of the polluted cities observed worldwide (Balakrishnan K et al, 2002).

Burning biomass in traditional stove (open fire, three stone stoves) of low efficiency and often with little ventilation emits smoke containing large quantities of particulate matter and gaseous pollutants such as carbon monoxide, nitrogen dioxide, sulphur dioxide, formaldehyde and dozens of toxic poly aromatic hydrocarbons such as benzopyrene. These substances have serious health consequences on the exposed population (Balakrishnan K et al, 2002).

Domestic cooking is one of the major activities of the rural Indian house wives. Cooking is carried out in an enclosed space with poor ventilation and in inefficient stoves. Women, young girls and children are the most affected group due to long duration exposure of biomass exposure. In developing countries, at the age of 15 years, girls start cooking and spend an average of 4-6 hours daily in kitchen for cooking. Therefore, during her lifetime, she is exposed to the biomass fuel smoke for 30-40 years, equivalent to 60,000 hours of exposure and inhaling 25 million liters of polluted indoor air (Salvi S and Barnes PJ, 2010).

Therefore, the present study was aimed at finding out the prevalence of respiratory symptoms among non-smoking women using biomass fuels in Sonatti village, Belagavi, Karnataka.

MATERIALS AND METHODS

The present study is a community based cross sectional study which was primarily conducted to assess The present study is a community based cross sectional study which was primarily conducted to assess the prevalence of respiratory symptoms among non-smoking women using biomass fuels in Sonatti village, Belagavi district, Karnataka the prevalence of respiratory symptoms among non-smoking women using biomass fuels in Sonatti village, Belagavi district, Karnataka. The study was approved by JNMC Institutional Ethics Committee on Human Subjects Research.

Universal sampling was used to achieve a sample size of 320 women. All non-smoking women aged 20 years and above involved in cooking were included in the population. Women having history of Bronchial asthma, Systemic and immune compromised diseases like HIV/AIDS and chest abnormalities like Scoliosis were excluded from the study since these conditions were expected to have a confounding effect on the outcome variable.

A standard pretested questionnaire was used which was designed and adapted from National Family health Survey-3 and United Kingdom Medical Research Council (UKMRC). The data was collected through the interview and observation of the house made by the investigator at the time of the survey. An informed written consent was obtained from all the participants before collecting the data. SPSS software version 13.0 was used and prevalence of disease was calculated using percentages.

RESULTS

The socio-demographic profile shows that the maximum number of study subjects i.e. 101 women (31.56%) were in the youngest age group i.e. 20-25 years followed by the women above 50 years who were 61 in number (19.06%). The range was from 20 – 70 years. Nearly 91% of the study subjects were married whereas 9% were unmarried. All the 320 women were living their lives below the poverty line (BPL) and belonged to Class V of socio-economic status. Majority of the women i.e. 62.81% of them were living in joint families and 37.18% lived in the nuclear families. 91.56% of all the study subjects were illiterate and there was only one woman who had studied after her secondary education. 90.3% of subjects were house wives and there was only one woman who was employed in a factory nearby whereas about 9% remained unemployed.

Table 1 shows that 71.88% women cooked food in houses with separate kitchen whereas 28.12% women did not have separate kitchen. About 96% household did not had chimneys whereas only 4% household had chimney facilities. Ninety five per-cent kitchens did not had windows, 4.68% kitchen had one window whereas 0.32% kitchen had more than two windows.

Table 1 Distribution Of Kitchen Characteristics According To Variables

Variable	Frequency	Percentage (%)
<i>Separate kitchen</i>		
Present	230	71.88
Absent	90	28.12
<i>Chimney</i>		
Present	13	4.06
Absent	307	95.94
<i>No. Of kitchen windows</i>		
None	304	95.00
1	15	4.68
> 2	1	0.32
Total	320	

Table 2 reveals that 42.5% of women had already spent more than 15 years in cooking using biomass fuels. Only 6 women (1.87%) had spent less than two years in cooking indicating an early involvement of girls in cooking. 123 women (38.43%) were spending around 4-5 hours per a day in their kitchens while cooking food with biomass fuels, whereas 39 women (12.18%) spent around less than two hours in their kitchens while cooking food with biomass fuels.

Table 2 Distribution Of Women According To Amount Of Time Involved In Cooking

Variable	Frequency	Percentage (%)
<i>Years spent in cooking</i>		
< 2 years	6	1.87
2 - 5 years	50	15.62
5 – 15 years	128	40.00
> 15 years	136	42.50
Total (n=320)	320	
<i>Hours spent in cooking / day</i>		
< 2 hours	39	12.18
2 – 3 hours	82	25.62
4 – 5 hours	123	38.43
> 5 hours	76	23.75
Total (n=320)	320	

Table 3 shows that 61 women (19.06%) experienced cough as the first thing in the morning in winter season, 58 women (18.12%) had experienced cough during day or night in winters whereas 31 women (9.68%) experienced cough in most days for three months. Forty women (12.5%) produced phlegm in the morning in the winter, 34 women (10.6%) produced phlegm in the day or night also and 17 women (5.31%) produced phlegm for most days in three months. Thirty women (9.37%) had experienced shortness of breath when hurrying, 24 women (7.5%) had experienced shortness of breath when walking with others whereas only 12 women (3.75%) had stopped for breath when walking at their own pace. Only one woman suffered an attack of wheezing in last 12 months and only one woman had chest illness in the past 3 years.

Table 3 Prevalence And Onset Of Respiratory Symptoms In Women

Variable	Frequency	Percentage (%)	Prevalence (%)
Cough			19.06
<i>Morning cough in winter</i>			
Yes	61	19.06	
No	259	80.94	
<i>Cough in day/night in winter</i>			
Yes	58	18.12	
No	262	81.88	
<i>Cough in most days for 3 months</i>			
Yes	31	9.68	
No	289	90.32	
Phlegm			12.50
<i>Phlegm in the winter morning</i>			
Yes	40	12.5	
No	280	87.5	
<i>Phlegm in the day or night</i>			
Yes	34	10.6	
No	286	89.4	
<i>Phlegm for most days in 3 months</i>			
Yes	17	5.31	
No	303	94.69	
Breathlessness			9.37
<i>Troubled by shortness of breath when hurrying</i>			
Yes	30	9.37	
No	290	90.63	
<i>Short of breath when walking with others</i>			
Yes	24	7.5	
No	296	92.5	
<i>Stopping for breath when walking at one's own pace</i>			
Yes	12	3.75	
No	308	96.25	
Wheezing			0.31
<i>Attack of wheezing in last 12 months</i>			
Yes	1	0.31	
No	319	99.69	
Chest illness			0.31
<i>Any chest illness in past 3 years</i>			
Yes	1	0.32	
No	319	99.68	
Total	320		

The overall measured prevalence of any of the respiratory symptoms among 320 women included in this present study was found to be 20.31%.

DISCUSSION

In our study, the age of the subjects ranged from 20-70 years, with the mean age being 34.9 years. 90.9% of the women were married among the 320 subjects and all belonged to Hindu religion. All the 320 women belonged to the Class V of socio-economic status. 91.5% of the women were illiterates and only 6.8% of women had completed their primary education. Almost all the women were housewives. In a household survey undertaken in Nepal, the mean age of the women was 36.1 years with a standard deviation of 16.7 years. 80.4% of the subjects were married and 52.4% were illiterate (Shrestha IL, Shrestha SL, 2005). In another study conducted with similar objective in Mexico, 841 women of 38 years and above who never smoked were included as subjects who were later categorized into women using biomass fuels and women using gas. Women who were in the category who used biomass fuels were slightly older, less educated and reported less income compared to those using natural gas (Regalado J et al, 2006).

The duration of cooking (in years) and the daily time spent for cooking (in hours) was found to have a significant impact on the prevalence of respiratory symptoms in women exposed to biomass smoke in our study. The proportion of women with respiratory symptoms increased along with an increase in the total number of years spent in cooking. Of the total 136 women who were involved in cooking for more than fifteen years, 49 of them (36.02%) had respiratory symptoms. Highest proportion (30.26%) of women with respiratory symptoms were seen in the group which spent the maximum hours per day i.e. 4-6 hours as well as 30.76% in least hours spent per day i.e. less than 2 hours. The fact of higher prevalence of respiratory symptoms in women who spent less than 2 hours per day in our study can be explained by a finding that older women who had respiratory symptoms spent less time as compared to young and healthy women. The differences were found to be statistically significant. Our results are in agreement with the Pakistan study on chronic bronchitis, where majority of women had cooked in the kitchen for 11-20 years. The prevalence of bronchitis symptoms in women who had cooked for a period < 10 years was 27.5% compared to 72.5% among women who had cooked for > 10 years. Symptoms of bronchitis was prevalent in 20.8% of women who spent > 2 hours per day cooking in the kitchen compared to 79.2% of women who spent > 2 hours per day cooking in the kitchen (Akhtar T et al, 2007).¹¹ In a study conducted in Northern India, the prevalence of asthmatic symptoms was significantly higher in females who had used biomass fuels for cooking for more than 20 years than for 1-20 years usage (Behera D and Jindal SK, 1991).

Results from our study revealed a significant prevalence of 20.3% for respiratory symptoms in women cooking with biomass fuels. Cough was the commonest symptom as 61 women among 320 of them (19.06%) experienced it. Next commonest symptom was phlegm with 40 women (12.5%) experiencing it. Thirty women (9.37%) suffered from breathlessness whereas one woman each suffered from wheezing and chest illness in the past. Results from a similar study done in Zimbabwe showed an overall prevalence of respiratory symptoms as 94%. This high prevalence can be

explained by the fact that the sample size of the concerned study was as small as 48 women. The most commonly reported respiratory symptoms in women were cough (79%), chest colds (70%), and phlegm (51%) which was agreeable with our results (Rumchev K *et al*, 2007). Results from a similar study conducted in Mexico, revealed a 5.1% prevalence of asthma diagnosed by a physician and 37% of women reported having cough or phlegm most of the day. 46.1% of women exposed to biomass smoke reported to have wheezed in the past (Regalado J *et al*, 2006).

CONCLUSION

This study contributes to the evidence of the adverse impact of indoor air pollution from biomass combustion on respiratory health of women involved in cooking with biomass fuels. Prevalence of respiratory symptoms existed among rural women exposed to biomass fuels in cooking.

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