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08

INDOOR AIR POLLUTION AND ITS IMPACT ON WOMEN's HEALTH IN SIKAR DISTRICT

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Abstract: *According to the latest World Health Organization (WHO) report, 8 million people die every year globally because of air pollution. Among these, 4.3 million die because of air pollution from household sources and 3.7 million die because of ambient air pollution. This study explores the risk that women face from cooking food, using biomass fuels, on traditional stoves and in unventilated rooms. They are exposed to fire, smoke and toxic pollutants. Women are more at risks to health problems especially respiratory diseases because of their long hours of involvement in cooking food. This study is based on primary sources of data collected with the help of questionnaire interviews from 1000 women belonging to different income groups. Since women are responsible for cooking they were selected as respondents. This study is designed to examine the type of household energy used, pollution levels emitted from different types of cooking fuels, and the correlation between risk factors and respiratory health. About half of the women respondents were found traditional cooking fuels and were more prone to respiratory problem and diseases.*

Key words: Indore Air Pollution, Health Impact, Women Issues, Diseases.

Introduction

In the words of Rosalynn Carter, "There is nothing more important than a good, safe and secure home". It is believed that a house is the most secure and healthy environment for any individual. However, the house can also be a source of various air pollutants that can have a significant adverse impact on health. The use of unprocessed biomass fuels for cooking has been identified as the major source of indoor air pollution because it releases 50 times more noxious pollutants than gas (Smith, 1990). The most important include particulate matter, carbon monoxide, nitrogen dioxide, sulphur dioxide, formaldehyde and carcinogens such as benzo (a) pyrene and benzene (Ezzati et al., 2000). Levels of indoor particulate matter, which are commonly measured in milligrams per cubic meter, reach transient peaks of as high as 20-80 mg/ $m^3$when fires are started or stirred; these peaks from up to half of total exposure in women, as they are required to stay close to the fire while cooking. The stoves or chulha (u shaped open stoves made of bricks and mud) used for cooking purpose are not energy efficient in which the fuels are not completely burned. Nearly three fourth of the Indian households(including 3 out of 10 urban households and 8 out of 10 rural households) use open fires or chulhas without chimneys (NFHS-3, 2007). Breathing of polluted air is as old as mankind, particularly since the domestication of fire. Evidence of fire accompanied hominid remains from 5 lac years ago in China (James 1989) and offered people then a survival advantage through cooking foods, heating and keeping bugs and beasts away. When people built shelters for dwellings, they also brought pollutants into the indoor living space (Spengler and Samet, 1991). Today, burning biomass- principally wood, crop residues and dung remains an important source of exposure to a variety of toxins mainly in the

developing countries. About 3 billion people use biomass and the remainder use coal for most of their household energy needs (Bruce et al., 2006). The percentage of people using solid fuels varies widely among different regions and countries ranging from 77 per cent in Sub -Saharan Africa, 75 per cent in South- East Asia, 74 per cent in Western Pacific Region to 36 per cent in Eastern Mediterranean Region and 16 per cent in Latin America and Caribbean and Central and Eastern Europe. In most of the industrialised countries, use of solid fuels falls below 5 percent (Rehfuess et al., 2006). In India 78 percent of population relied upon biomass fuel and 3 per cent used coal (Census of India, 2001)

Indoor air pollution is the most direct physical health risk. It contributes to acute respiratory infection in young children; chronic lung diseases and cancer in adults and adverse pregnancy outcomes (such as still births) in women exposed during pregnancy (Park, 2007). It increases the risk of other health problems including low birth weight, prenatal mortality, asthma, otitis media, tuberculosis, nasopharyngeal cancer, cataracts, blindness and cardiovascular diseases (WHO, 2005). High concentration of indoor air pollution increases the risk of acute respiratory infection (ARI). On the basis of site of infection it is referred to as ARI of upper (AURI includes common cold, pharyngitis, and otitis media) or lower (ALRI includes epiglottis, laryngitis, laryngotracheitis, bronchitis, bronchiolitis and pneumonia) respiratory tract (Park, 2007). Keeping these aspects in mind an attempt has been made to examine the links between indoor air pollution and respiratory health of women in Sikar district.

Study Area

The district is located in the north eastern Rajasthan between 27^0 21' to 28^0 12' north latitudes and 74^0 44' to 75^0 25' east longitudes. It is bounded by Churu and Jhunjhunu districts in the north, by Jaipur district in the east, by Nagaur and Jaipur districts in the south and in the west by Churu and Nagaur districts of Rajasthan. Sikar is situated midway between Bikaner and Jaipur on national highway number 11. Sikar is located in the Shekhawati region of Rajasthan. There is still no broad gauge railway track in the district. It is connected through meter gauge to Delhi, Jaipur, Rewari, Bikaner, Sri Ganganagar, Churu, and Jhunjhunu. The district is divided in six administrative tehsils viz. Sikar, Fatehpur, Laxmangarh, Neem Ka Thana, Danta Ramgarh, and Sri Madhopur.

Database and Methodology

The study is mainly based on primary sources of data which have been collected through household surveys and monitoring of the level of pollutants released from cooking fuels. Field work was conducted during 2017-18.

(i) For selecting the sample, multistage stratified sampling design was acquired. The first stage consisted of selection of village from the total number of village. In second stage, from each selected village about 100 households were selected and from each sampled households a senior women was chosen as the respondent because women are engaged in household activities and they know more about their household conditions. The total sample size consisted of 1200 households, of which, 120 (10 percent) were from the high income group (>Rs. 20,000 per month), 300 (25 percent) from medium income group (Rs.10, 001-20,000 per month) and 420 (35 percent) from low income group (Rs.5001-10000 per month) and 360 (30 per cent) from very low income group (< Rs.5000 per month).

(ii) A questionnaire was prepared with the help of questionnaires used in similar studies to collect information regarding the general profile of the sampled households, types of households energy used for cooking food, ventilation facility, time spent for cooking, exposure to smoke and heat and occurrence of associated respiratory diseases.

(iii) On the basis of collected information, risk factors were identified and links between indoor air pollution, types of household energy used and respiratory health of women were examined.

(iv) Emphasis was laid on both primary and secondary data to collect large volume of information in respect of indoor air pollution. Based on secondary data a general profile of the district out lined on the basis of above study. From the district 12 sample villages were studied for detailed study.

(v) The selection of villages was based on random sampling. At the micro level the study has been done on the basis of questionnaire by personal interview method with the farmers. There were 100 household interviewed from each village.

Income Wise Profile of the Sampled Women Respondents

The detailed survey was conducted in all 12 villages of the district. The latest data have also been collected. Table no 2 shows that about 35 per cent of the women respondents were from low income group, 25 per cent from medium, 30 per cent from very low and 10 per cent from high income group. Regarding their family size and number of children it was observed that most of lower income women were having large family size i.e. > 5members (70 percent of very low, 50 percent of low) and were having more number of children i.e. 4 and more (45 percent of low and 70 percent very low) than the medium and high income women respondents. Their educational status shows that more than three fourth (85 percent of very low, 75 percent of low) of the lower income women respondent were uneducated while one fourth of the medium and only few from the high income category were uneducated. Regarding awareness about indoor air pollution and its health effect, it was observed that more than half of the lower income women respondents (70 per cent of very low, 60 percent of low) were not aware about ill effects, while 44 percent of the medium and 5 percent of high income women respondents were also not aware about the ill effects of the indoor air pollution. Thus, it was observed that as income decreases the family size and number of children increases and level of education and awareness (about the use of traditional fuels, place of cooking, type of stove used, indoor air pollutants and effect on health) decreases.

Table 1: Income wise Profile of the Sampled Women Respondents

Income Group	Percentage of households	No. of family members (in %)		No. of children (in %)		Educational Status (in %)		Awareness about indoor air pollution (in %)	
		1-5	> 5	1-4	> 4	Educated	Uneducated	Yes	No
High	10	80	20	90	10	95	5	95	5
Medium	25	56	44	60	40	71	29	56	44
Low	35	50	50	55	45	25	75	40	60
Very low	30	30	70	30	70	15	85	30	70
Total	100	48.5	51.5	52.25	47.75	40.5	59.5	46.5	53.5

Source: Based on Field Survey

Energy Used for Cooking

Table no. 2 shows that women belongings to lower income group tend to use the traditional fuels (agricultural residues/ twinges, wood, dung cake, kerosene, coal etc.) and stoves

(chulas, kerosene stoves etc.) in higher percentage (95 percent of very low income, 60 percent low income). The entire higher income group and 80 percent of medium group reported of using modern cooking fuels (LPG, electricity) and stoves (gas stoves, heaters). Some of medium income group (10 percent) and some of lower income group (20 percent) were found using both traditional and modern fuels and stoves in order to save money or at the time of emergency when gas cylinders were not available or either at the time of power cut. It can be analyzed that as the income increases households have higher quality of fuel choices.

Regarding the place of cooking food it was observed that the very low income women respondents reported of cooking either in verandah (40 percent) or in a multipurpose room (30 percent) or in open space (30 percent). Most of medium income (70 percent) and entire high income respondents reported of cooking in a separate kitchen. During the survey, 50 percent of very low, 40 percent of low and 20 percent of medium income women respondents reported of improper ventilation in their homes. Regarding the time spent for cooking, means being exposed to smoke or fire.it was observed that more than half of the women respondents were spending > 3 hours per day in kitchen (80 percent of the very low, 70 percent of low, 40 percent of medium and nearly 25 percent of high income).

Table 2: Income wise Household Energy Used for Cooking

Income Group	Type of cooking stove used (%)			Place of cooking food (%)				Proper ventilation (%)		Times spend for cooking (per day) (%)	
	Traditional fuel	Modern fuel	Both Traditional / Modern	Verandah	Separate kitchen	Multipurpose room	Open space	Yes	No	< 3 hrs	>3 hrs
High	-	100	-	-	100	-	-	100	-	75	25
Medium	10	80	10	16	70	6	8	80	20	60	40
Low	60	20	20	30	30	20	20	60	40	30	70
Very Low	95	5	-	40	-	30	30	50	50	20	80
Total	52	38.5	9.5	26.5	38	17.5	18	66	34	39	61

Source: Based on Field Survey

Respiratory Diseases and Related Problem

Table no 3 shows that about 90 percent of the very low, 80 percent of the low, 50 per cent of the medium and 40 percent of the high income women respondents reported of suffering from respiratory diseases and related problems. Of the very low income women respondents, 21.61 per cent reported of AURI, 21.61 percent reported that their young ones were suffering from child ARI, 15.44 per cent reported of ALRI, 6.17 percent reported of dyspnoea, 10.49 percent reported of other respiratory infections, 6.17 percent reported of tuberculosis, 6.17 percent reported asthma, 6.17 percent reported of emphysema and 6.17 percent reported from asphyxia. Almost the same condition exists among the low income women respondents table no 4 shows that as the income increases the use of modern fuels for cooking purpose, use of neat, hygienic separate well ventilated kitchen increases and the time involved in cooking decreases. As the income increases the exposure of women to smoke, heat and fire decreases, so they do not suffer from respiratory diseases as the low income women.

Table 3: Respiratory Diseases and Related Problems Reported

Income Group	Respiratory Diseases Due to Indoor Air Pollution (%)		Respiratory Diseases and Related Problems Due to Indoor Air Pollution								
			If Yes (Type) (%)								
	Yes	No	Child ARI	ALRI	AURI	Emphysema	Asphyxia	Dyspnea	Asthma	Tuberculosis	Any Other
High	40	60	31.2	10.4	31.2	-	-	4.1	10.4	4.1	8.32
Medium	50	50	20.0	13.3	20.0	6.6	6.6	6.6	6.6	6.6	13.3
Low	80	20	17.8	14.8	17.8	5.9	8.9	8.9	5.9	5.9	13.6
Very Low	90	10	21.6	15.4	21.6	6.1	6.1	6.1	6.1	6.1	10.4
Total	715	28	20.4	14.5	20.4	5.8	6.9	7.3	6.42	6.0	12.1

Source: Based on Field Survey

ARI: Acute Respiratory Infection

ALRI: Acute lower Respiratory Infection

AURI: Acute Upper Respiratory Infection

Any Other* Includes Difficulty in Breathing, Cough Blockage in Lungs, Infections of Respiratory Tract etc.

Conclusion

The first and the most important step in the prevention of illnesses resulting from the use of biomass fuels is to educate the public, administrators and politicians to ensure their commitment for the improvement of public health. Although a lot has been done in the arena of household air pollution, there is still room for further understanding the newer sources of indoor air pollution. Given the knowledge we have regarding household air pollution, long-term measures to curb its health effects have remained grossly insufficient. More than 60 percent of the households were cooking in verandas, multipurpose room or in open spaces without having proper ventilation in cooking area and were found spending long hours for cooking. More than 50 percent of sampled household were using traditional fuels, because of their socio- economic backwardness, lack of education, unawareness about indoor air pollution, customary thinking and non-affordability of modern cooking fuels. This long exposure poses high risk of health hazards particularly respiratory diseases. The toxic emission from traditional fuel was found very high as compared to that from modern LPG fuel while nearly all the low income households are dependent on traditional fuels; they are thus exposed to high levels of indoor air pollution. This study concludes that poverty, lack of education and awareness were the major factors affecting choice of cooking fuel, place of cooking and level of respiratory health. It may be said that the burden of diseases due to indoor air pollution is highly concentrated among poor women and children in rural households.

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