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DETERMINANTS OF PREVENTIVE PRACTICES IN RELATION TO AIR POLLUTION AMONG URBAN SLUM DWELLERS OF KOLKATA, INDIA

Air Pollution

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ABSTRACT

BACKGROUND According to World Health Organization a major share of morbidity and mortality burden attributed to key environmental factors globally and regionally. Behind this amount of death and disease, one of the important factors is indoor and outdoor air pollution. India has14 out of the 15 most polluted cities in the world in terms of PM 2.5 concentrations. Unfortunately, in many areas of the world, concentrations of ambient air pollutants currently exceed levels believed to substantially increase risks of acute and chronic adverse human health effects. Affected areas include many of the urban communities where a majority of the world's population now lives and works

OBJECTIVE The present study was conducted to assess the determinants of good preventive practice in relation to air pollution among the urban slum dwellers of Kolkata

MATERIALS AND METHODS An observational cross-sectional study was conducted among 242 urban slum residents of Kolkata. Interview for data collection was done with the help of a pre-designed pre-tested, semi structured schedule. The individual knowledge, attitude and practice questions were awarded marks against each correct response. Finally, composite scores were obtained in the above-mentioned domains separately against each study individual. Suitable statistical tests and Multivariate Logistic Regression were conducted to establish the relationship.

RESULTS The mean knowledge, attitude and practice scores of study population were 7.79 (SD 3.64), 13.70 (SD 2.38) and 1.19 (SD 1.59) respectively. Overall practice score among the study population was poorer than their knowledge and attitude. The association was observed between three domain scores and important socio demographic variables. Respondents who were using LPG as cooking medium their knowledge, attitude and preventive practices were significantly better than who were using other cooking medium. Older subjects' preventive practices were better than the younger one in relation to air pollution. People who were staying in overcrowded condition, their knowledge and practice are significantly better than the others.

DISCUSSION AND CONCLUSION Using LPG as cooking medium, higher age and presence of overcrowding were the most important determinant in development of good preventive practice in relation to air pollution. Evolving knowledge about environment-health interactions can support the design of more effective preventive and public health strategies that reduce corresponding risks to health.

KEYWORDS

air pollution, preventive practices, slum dwellers, Kolkata

INTRODUCTION

According to World Health Organization a major share of morbidity and mortality burden attributed to key environmental factors globally and regionally. Behind this amount of death and disease, one of the important factors is indoor and outdoor air pollution. Approximately one-quarter of the global disease burden, and more than one-third of the burden among children, is due to modifiable environmental factors. An estimated 24% of the global disease burden and 23% of all deaths can be attributed to environmental factors as per *World Health Report* in 2004. Developing regions carry a disproportionately heavy burden for communicable diseases and injuries. While in developed countries, an estimated 20% of such infections are attributable to environmental causes, rising to 42% found in developing countries. Globally, the per capita number of healthy life years lost due to environmental risk factors was about 5-times greater in children under five years of age than in the total population. Number of healthy life years lost as a result of childhood lower respiratory infections is 800-times greater, per capita; 25-times greater for road traffic injuries; and 140-times greater for diarrhoeal diseases. In certain very poor regions of the world, however, the disparity is far greater. The lower respiratory infections are associated with indoor air pollution related largely to household solid fuel use and possibly to second-hand tobacco smoke, as well as to outdoor air pollution. **(1)** The first population-based study that showed significant improvements in life expectancy in relation to reductions in PM2.5 concentrations was conducted in the United States. The study showed a clear relationship between reduction in fine-particle concentrations and life expectancy. **(2)** This observation was confirmed in a cohort study of Swiss adults, which demonstrated that decreases in ambient PM10 levels were associated with reductions in respiratory symptoms. **(3)**

According to the WHO, India has14 out of the 15 most polluted cities in the world in terms of PM 2.5 concentrations. An air quality index (AQI) is used to quantify the level of air pollution in a particular geographical area. Public health risks increase as the AQI rises. As per the Central Pollution Control Board of India, the four major Indian cities, air pollution was consistently worse. Delhi was in the first rank consistently over more than ten years. Kolkata was a close second, followed by Mumbai, Chennai air pollution was least amongst the four. **(4)** In Delhi It was estimated that about 3000 metric tons of air pollutants were emitted every day, with a major contribution from vehicular pollution (67%), followed by coal-based thermal power plants (12%). The higher air pollution is a major contributor of increased respiratory morbidities. **(5)**

Air pollution is managed most effectively by collective action to control emissions of both primary air pollutants and precursors that react to form secondary air pollutants. Unfortunately, in many areas of the world, concentrations of ambient air pollutants currently exceed levels believed to substantially increase risks of acute and chronic adverse human health effects. Affected areas include many of the urban communities where a majority of the world's population now lives and works **(6)** In this background the present study was conducted to assess the determinants of good preventive practice in relation to air pollution among the urban slum dwellers of Kolkata.

MATERIALS AND METHODS

An observational cross-sectional study was conducted among 242 urban dwellers residing in Kolkata city, India. Elderly participants residing permanently (at least for more than one month) in the locality were selected for the study after obtaining written informed consent for participation. However, those with diagnosed respiratory problems, cognitive impairments, or debilitating illnesses, and bed-ridden patients were excluded. It was noted from a previous study, that the level of preventive practice related to air pollution was 32%. **(7)** Based

on this the sample size was calculated 242 considering relative allowable error 20%. The list of total adult population of the slum was enlisted and among them 242 subjects were chosen by simple random technique. Interview was conducted with the help of a pre-designed pre-tested, semi structured schedule. Socio-demographic information e.g. age, gender, religion, no. of family members, type of family, monthly family income was self-reported by the respondents. Few environmental parameters (cooking medium used by the family, presence or absence of setback area, no. of living rooms, presence or absence of overcrowding) were directly observed at the time of house visit. Socio economic status scale was calculated by Modified BG Prasad (2019) scale according to per capita income.

As per the study team consensus, the individual knowledge, attitude and practice questions were awarded marks against each correct response. If a question had multiple correct answers; one mark was awarded against each correct response. Finally, composite scores were obtained in the above-mentioned domains separately against each study individual. For univariate analysis the scores of three domains were dichotomized based on their mean taken as cut off. The mean and above scores were designated as higher knowledge, higher attitude as well as good practices respectively. The baseline socio demographic data was analysed as per frequency distribution (categorical variables) and mean and standard deviation (continuous variables). Socio demographic attributes like age, period of stay was dichotomized taking mean as their cut off. Mean and above were taken as older age or longer period of stay. Cooking medium was categorized whether used LPG or other cooking medium. Types of family was two types namely nuclear and joint family. Set back area is the presence of open spaces around the house to facilitate ventilation. In urban area the guideline is one third area of space will be kept vacant for adequate ventilation. **(8)** The respondent's houses were divided into two groups based on whether adequate set back area was present or absent. Families was divided into two categories depending on whether anybody smokes inside houses or not. Overcrowding was calculated based on person per room criteria. **(9)** Socio economic status (SES) was calculated based on Modified B G Prasad scale (2019) **(10)** which provides five classes based on per capita income. Later, for the analysis purpose the upper, upper-middle and middle socioeconomic class were clubbed into higher SES and rest were clubbed into lower SES as study median fell into middle class. Univariate analysis was done with different socio demographic factors and knowledge, attitude and practice score. Multiple Logistic Regression analysis was done after taking the practice score as dependent variable. The significant factors of univariate analysis were considered in the model as well as knowledge and attitude composite scores were also taken as co variates. The statistical calculation was done with the help of Statistical Package of Social Sciences (SPSS) version 25. **(11)** Ethical clearance was obtained from the institutional ethics committee of Medical College and Hospital, Kolkata (Ethics approval no. MC/ KOL/ IEC/ ACADEMIC/ 313/ 04-2014, Dated 17.05.2014.)

RESULTS

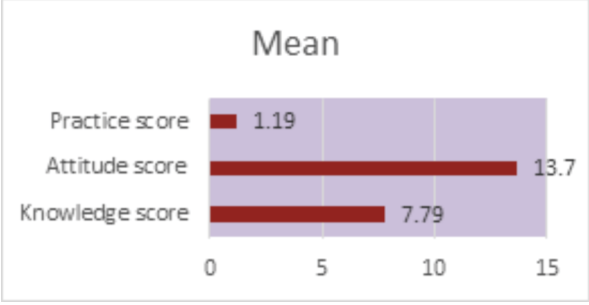
The mean age of study population was 43.12 years (SD 14. 57 years). Their average period of stay in that locality was 239.88 months (SD 228.92 months). Among the subjects, 57.9% were male; majority (94.6%) were Hindu by faith and 64% belonged from nuclear family. As per Modified BG Prasad scale, most of them (41.8%) belonged from lower middle class followed by middle (29.1%), upper middle (19%), lower (7.6%) and upper class (2.5%) respectively. 57.9% family did not have any smoker present in their house as the time of data collection. As it was an urban slum hence most (81.8%) of the participant's household did not have any adequate open spaces (set back) in their surrounding and 58.7% experienced overcrowding in side their house. 66.5% used Liquid Pressurized Gas (LPG) as cooking fuel followed by kerosene (23.1%). Only few of them 10.4% used both of the cooking medium while cooking. (Table 1.)

Table 1. Socio demographic profile of study population (n=242)

Name of the variables	Types	Frequency	Percentage
Gender	Male	140	57.9
	Female	102	42.1
Religion	Hindu	229	94.6
	Muslim	13	5.4
Family types	Nuclear	155	64
	Joint	87	36
Smoker in the family	Present	102	42.1
	Absent	140	57.9
Socio economic status (Modified BG Prasad Scale 2019)	Upper	6	2.5
	Upper middle	46	19
	Middle	71	29.1
	Lower middle	101	41.8
	Lower	18	7.6
Cooking Medium	LPG	161	66.5
	Kerosene	56	23.1
	Mixed	25	10.4
Set back area	Present	44	18.2
	Absent	198	81.8
Over crowding	Present	142	58.7
	Absent	100	41.3
Mean age of study population 43.12 years, SD 14.57 years, Range 15-88 years			
Mean period of stay 239.88 months, SD 228.92 months, Range 01-1080 months			

The mean knowledge, attitude and practice scores of study population were 7.79 (SD 3.64), 13.70 (SD 2.38) and 1.19 (SD 1.59) respectively. Overall practice score among the study population was poorer than their knowledge and attitude (Figure 1.)

Figure 1. Bar diagram showing the mean scores in three domains (n=242)



The association was observed between three domain scores and important socio demographic variables. Respondents who were using LPG as cooking medium their knowledge, attitude and preventive practices were significantly better than who were using other cooking medium. Older subjects' preventive practices were better than the younger one in relation to air pollution. People who were staying in overcrowded condition, their knowledge and practice are significantly better than the others. (Table 2.)

Table 2. Association of various socio demographic attributes with Knowledge, Attitude and Practice (n=242)

Sl No	Name of the attributes	Association with								
		Knowledge			Attitude			Practice		
		X^2	P	OR	X^2	P	OR	X^2	P	OR
1	**Age**	.480	.488	.836	.564	.453	.824	5.555	**.018**	.525
2	**Gender**	1.206	.272	1.333	.007	.935	.979	.002	.962	.987
3	**Religion**	.338	.561	1.403	.166	.683	1.262	2.113	.146	.443
4	**SES**	2.434	.119	1.548	1.737	.187	1.440	.091	.762	1.092
5	**Family Types**	.005	.943	1.019	.306	.580	.862	.164	.686	.893
6	**Period of stay**	.030	.861	.955	2.604	.107	.656	.103	.748	.916
7	**Cooking Medium**	4.185	**.041**	1.765	5.805	**.016**	1.939	17.005	**.000**	3.775
8	**Set Back area**	3.549	.060	1.881	.575	.448	1.289	3.749	.053	1.912
9	**Smoking habits**	.701	.402	.803	2.705	.100	1.538	2.525	.112	.644
10	**Overcrowding**	6.475	**.011**	.512	1.290	.256	.743	8.847	**.003**	.444

Multiple Logistic Regression analysis was done after taking the practice score as dependent variable. The significant factors of univariate analysis were considered in the model as well as knowledge and attitude composite scores were also taken as co variates. The model showed that using LPG cooking medium, higher age and presence of overcrowding were the most important determinant in

development of good preventive practice in relation to air pollution. (Table 3.)

Table 3. Multiple Logistic Regression showing relationship between various factors and good practice (n=242)

		B	Std. Error	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Good practice	**Intercept**	-1.986	1.002	.047			
	Over crowding	.797	.316	**.012**	2.219	1.194	4.123
	Using LPG as cooking medium	-.983	.352	**.005**	.374	.188	.746
	Higher age_	.774	.313	**.013**	2.169	1.174	4.007
	Better Air pollution knowledge	.287	.297	.334	1.332	.744	2.384
	Better Air pollution attitude score	.271	.298	.364	1.311	.731	2.353

DISCUSSION

The present study tried to analyse the determinants of preventive practices in relation to air pollution. A study conducted in China found over all "good practice" regarding air pollution and prevention of respiratory problems among children were very poor even in hospital as well as community settings. Little more respondents-scored in the "fair practice" range while-most of the subjects' scores were distributed in the "poor practice" range. **(12)** Almost similar findings found in the present study that the overall practice score was also poor among the study participants. The practice score was much poorer than knowledge which was again poorer than attitude of the same subjects. This may be due to the fact that they have received the knowledge from different platforms which may turned out in their attitude but those knowledges were not properly converted in their preventive practices. Though there was a positive corelation between knowledge, attitude and practices regarding air pollution which has been described elsewhere. The same findings were depicted in earlier mentioned study, **(12)** that the respondents' practices scores were much lower than their knowledge and attitudes scores. The reason of low practices score was the lack of right air pollution self-protection guidance. Perhaps people were unaware of what kind of measures should be taken to protect them from the polluted air. It is well understood that pollution has a profound effect on health; therefore, reduction of pollution has a positive effect on health, particularly the health of susceptible individuals. Reductions in the levels of air pollution can be achieved in many ways, and governments can play a key role. **(13)** A study on behavioural strategy to minimize air pollution exposure in pregnant women provided a framework to modify some psychosocial determinants of air pollution preventive behaviour using constructs of transtheoretical model of behaviour change. The results suggest the importance of education and makes enlightenment of the air pollution risk knowledge accelerate. **(14)** Findings of such studies are particularly relevant to health care policymakers and practitioners. Evolving knowledge about environment-health interactions can support the design of more effective preventive and public health strategies that reduce corresponding risks to health. Public and preventive health strategies that consider environmental health interventions can be very important. Such interventions are cost-effective and yield benefits that also contribute to the overall well-being of communities**. (1)**

CONCLUSION AND RECOMMENDATION

Using LPG as cooking medium, higher age and presence of overcrowding were the most important determinant in development of good preventive practice in relation to air pollution. Evolving knowledge about environment-health interactions can support the design of more effective preventive and public health strategies that reduce corresponding risks to health. Public and preventive health strategies that consider environmental health interventions can be very important.

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