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Association of respiratory health of women and housing pattern: a comparative study of two tribes of Maharashtra

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ABSTRACT

Almost 1.6 million people die every year due to indoor air pollution that means 1 death occurs per second. In India, this is a least focused and discussed area in rural settings and perhaps never studied in tribal population. Overall, 8% of Indian population comprises of tribes. The present study was carried out to show that association of respiratory health and indoor air pollution among tribal women belongs to two different tribal groups residing in interior locations of Maharashtra, India. A longitudinal study was conducted among Bhill (n = 46) and Mahadev Koli (n = 60) women, during rain and summer. Non probability purposive sampling was used to select the sample. Interview schedules for respiratory health and housing pattern were collected from women on respiratory health. Independent sample t- test shows significant difference in Forced Vital Capacity (FVC) post figures (P value = 0.02) during both the seasons. More obstruction is observed among Mahadev Koli women (60.78%). We conclude that, rudimentary traditional housing pattern in combination of modern infrastructure invasion plays important role in respiratory health of selected tribes. Prolonged wheezing and associated headache indicates presence of smaller air way obstruction and Chronic Obstructive Pulmonary Diseases (COPD). Construction type, material used to build a house and seasonal differences in both the locations are significant factor for obstruction.

Introduction

National Centre for Macroeconomics and Health, Government of India, conducted a survey and estimated that there are 45 million asthma and Chronic Obstrctive Pulmonary Diseases sufferers in India and this number is expected to increase to 57.2 million over the next decade (Hegde et al. 2013). And it is reasonably increased and crossed the expected values because of high rise in urban pollution (Ranade 2008; Chouhan et al. 2017). This health burden is much higher than those due to other non – communicable diseases such as hypertension, ischemic heart disease, diabetes and cancer. Unfortunately, a large number of people suffering with Obstructive Airways diseases (OAD) in India remain undiagnosed, wrongly diagnosed, under treated, untreated and wrongly treated. Sufficient evidence is available to estimate risks most confidently for Acute Respiratory Infections (ARI), Chronic Obstructive Pulmonary Disease (COPD) and lung cancer. Estimate for tuberculosis (TB), asthma and blindness are of intermediate confidence (Smith 2000). Economic burden of asthma is relatively high in India. Global estimates published in 2005 shows that India was having economic burden of rupees 7641 crores due to asthma and rupees 25,209 crore due to COPD.

Links between indoor air pollution and conditions like cataract, low birth weight, and cancer of upper airways are prominently emerging in medical science research (Smith 2000). In a study by Surya Kant and Barkha Gupta, they consider 'package' which includes increased consumption of tobacco smoking amongst females and children, changing dietary pattern and increasing burden of industries and population leading to increased air pollution responsible for degraded respiratory health (Kant and Gupta 2008; Rumchev et al. 2017; Wen et al. 2017).

This study focuses on one of the least studied area in rural India and perhaps never studied in tribal sector – an association of Acute Respiratory Health of women and housing pattern. Limited number of studies has elaborated housing pattern and its relation to indoor air and respiratory health (Smith 2000; Venkataramani 2017; Wen et al. 2017). Such studies are primarily done in modern settings. In the context of tribal community, type of cooking stove, kitchen configuration and housing pattern are rudimentary, which may lead to the high concentration of indoor air pollution.

Housing pattern plays a key role in the context of indoor air pollution. In US, study conducted by Wen et al. concludes that, health related problems were worse among people living in mobile houses, better in single family apartment and good in multifamily apartment (Wen et al. 2017). Different tribes have their own housing pattern which is completely dependent on ecology in which they live. Seasonal variations play significant role here. Important factor is, even if housing material is changing, pattern of construction of house remains same. Focusing the issue seems crucial and may play a vital role in understanding real causes behind respiratory health. Figures for tribal areas are not available. At some level we may have achieved success but figures regarding mortality and morbidity are still not satisfactory. Unhygienic conditions, malnutrition and epidemics are major and focused factors, which are responsible for mortality and morbidity among women and children.

Tribal and rural households in developing countries do face issues of indoor air pollution is significantly higher and it is crucial to study this to discover right policy to improvise the health of the population (Smith 2000; Mukherjee 2004; Ranade 2008; Jain et al. 2015). The high risk of diseases among children under 5 also indicates the need to mainstream this issue of indoor air pollution in children's health initiatives. Finally, women who are at the centre for care giving at the family level, bear a significant disease burden that can have implications beyond their own health (most importantly, children's health). Complex inter linkages exists between indoor air pollution and health risks, thus to minimise negative impact, holistic understanding of such linkages are essential.

Materials and Methods

Two tribal communities were selected for the study, Bhils and Mahadev Kolis. Bhils of village Savar, Nandurbar district and Mahadev Kolis of village Ahupe, Pune district were part of the study. Bhil and Mahadev Kolis are major tribes of Maharashtra having rich history of existence (Ghurye 1963). Both the tribes majorly located in prominent mountain ranges of the state, Satpuda and Sahyadri, respectively. Villages selected for the study were located interiors of these ranges and mostly depend on forest for their daily needs. There is no significant impact of urbanization seen in village setting and livelihood pattern, except the tar roads and introduction to cement for construction (Ranade 2008). To understand the association between housing pattern and impact of indoor smoke on respiratory health, it was important to locate villages where urban vehicular pollution or other type of polluting sources are not available. Both villages belong to different ecological settings and unique housing pattern.

Total 80 women from each tribe were selected for the study for spirometry test. Out of all, 60 Mahadev Koli women and 46 Bhil women successfully performed spirometry. Details related to housing pattern were documented with the help of interview schedule. Data were collected in two

different seasons separately to understand seasonal differences and impact.

Non-probability purposive sampling was used to select sample. Married as well as unmarried women from 18 to 65 years of age were selected who were engaged in cooking for both the times i.e. morning and evening. Women who completely agreed for the test and understood the procedure were selected and tested. Samples that were unable to perform the test in a right way were discarded from data. All women selected were non-smokers, never consumed tobacco and alcohol.

Analysis was done in SPSS (Version - SPSS 17). Mean, standard deviation, independent t test, paired t tests and p values were used for analysis. Significance was assessed by using p value ($p < 0.05$). On the basis of spirometric parameters, FEF25-75 values (gives obstruction in smaller airways) and FEV1/FVC ratio (gives obstruction in upper airways) was calculated. Correlation between obstructions based on FEF 25-75 pre % predicated and other variables were analysed.

Ethical Consideration

The present study was conducted post approval of ethics committee. Researcher has undergone specialized training designed by Chest Research Foundation (CRF), Pune to conduct spirometry. Chest Research Foundation is highly specialised institute in the area of respiratory health, related medication and research. Total 8 days were required to understand, perform and analyse spirometry tests during training. Purpose of study, importance of test and procedures were explained to the subject before conducting spirometry. All equipment's were sterilized and cleaned during tests and discarded at right time. Informed written consent in regional language was taken and maintained by the researcher.

Results

Spirometry and Related Analysis

Comparative analysis of spirometric parameters based on season as well as tribe has been discussed. FVC Predicted, FVC Pre, FVC Post, FEV1 Predicted, FEV1 Pre, FEV1 Post, FEF 25-75 Predicted, FEF 25-75 Pre, FEF 25-75 Post, FEV1/FVC Pre, FEV1/FVC Post, FVC Pre % Predicted, FVC Post % Predicted, FEV1 Pre % Predicted, FEV1 Post % Predicted, FEF 25-75 Pre % Predicted and FEF 25-75 Post % Predicted were the spirometric parameters were considered and analysed for this study.

Studying and analysing all this spirometric parameters were important to check upper and lower airways congestions. All subjects were checked against these parameters which helps researcher to see existing differences in respiratory health. Bronchodilator is used to get Post- test values and on that basis present of upper and lower airway congestions were calculated. FEV1/FVC ratio explains the condition of upper airways and FEF 25- 75 values explains the lower air way congestions. Predicted values are ideal condition of lungs health calculated by software on the basis of height, weight and other required parameters.

The independent sample t test shows slight significant difference in FVC Pre-test (p value = 0.09), strong significant difference in FVC Post-test (0.02) and FEV1/FVC Pre-test (p value = 0.08) in summer between the two Tribes (Table 1). During summer Mean Difference values among both the tribes are as follows, FVC Predicted values (-0.01), FVC Pre-test (-0.14), FVC Post-test (-0.16), FEV1 Predicted values (-0.01), FEV1 Pre-test (-0.04), FEV1 Post-test (-0.09), FEF 25-75 Predicted values (0.05), FEF 25-75 Pre-test (0.24), FEF 25-75 Post-test (0.14), FEV1/FVC Pre-test (0.03) and FEV1/FVC Post-test (0.02). All negative and normal mean difference values show that there no much difference in all the parameters of spirometry in Bhil and Mahadev Koli during summer. Negative mean differences explains the closeness of Pre-test values of both the tribes.

After application of independent sample t test, it is observed that, there is significant difference in FVC Pre-test (p value = 0.000), FVC Post (p value = 0.000), FEF25-75 Pre (p value = 0.04) and FEV1/FVC post (p value = 0.04) values in rain between the two Tribes (Table 2).

Table 1: Independent Sample t Test Comparison between Bhils of village Savar and Mahadev Kolis of village Ahupe during summer.

Season	Spirometry Parameter	t-test for Equality of Means						
		t	Df	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		p Value
						Lower	Upper	
Summer	FVC Predicted	-0.15	103	-0.01	0.07	-0.14	0.12	0.88
	FVC Pre	-1.73	104	-0.14	0.08	-0.30	0.02	0.09
	FVC Post	-2.34	104	-0.16	0.07	-0.29	-0.02	**0.02***
	FEV1 Predicted	-0.13	103	-0.01	0.06	-0.13	0.12	0.90
	FEV1 Pre	-0.60	104	-0.04	0.07	-0.18	0.10	0.55
	FEV1 Post	-1.31	104	-0.09	0.07	-0.24	0.05	0.19
	FEF 25-75 Predicted	0.74	103	0.05	0.07	-0.09	0.19	0.46
	FEF 25-75 Pre	1.42	104	0.24	0.17	-0.10	0.58	0.16
	FEF 25-75 Post	0.78	104	0.14	0.19	-0.23	0.51	0.44
	FEV1/FVC Pre	1.74	104	0.03	0.02	0.00	0.07	0.08
	FEV1/FVC Post	0.78	104	0.02	0.02	-0.03	0.06	0.43

Mean differences of both the tribes during rain are as follows, FVC Predicted values (0.01), FVC Pre (-0.26), FVC Post (-0.24), FEV1 Predicted (0.01), FEV1 Pre (-0.10), FEV1 Post (-0.11), FEF 25-75 Predicted (0.08), FEF 25-75 Pre (0.37), FEF 25-75 Post (0.16), FEV1/FVC Pre (0.04) and FEV1/FVC Post (0.04). All Minus and normal mean difference values show that there no much difference in in all the parameters of spirometry in Bhil and Mahadev Koli during summer. Minus mean differences explains the closeness of Pre-test values of both the tribes.

Table 2: Independent Sample t Test Comparison between Bhils of village Savar and Mahadev Kolis of village Ahupe during Rain.

Season	Spirometry Parameter	t-test for Equality of Means						
		t	Df	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		p Value
						Lower	Upper	
Rain	FVC Predicted	0.11	103	0.01	0.07	-0.13	0.14	0.91
	FVC Pre	-3.20	104	-0.26	0.08	-0.42	-0.10	**0.00****
	FVC Post	-3.04	104	-0.24	0.08	-0.39	-0.08	**0.00****
	FEV1 Predicted	0.14	103	0.01	0.06	-0.12	0.13	0.89
	FEV1 Pre	-1.36	104	-0.10	0.07	-0.24	0.04	0.18
	FEV1 Post	-1.59	104	-0.11	0.07	-0.24	0.03	0.11
	FEF 25-75 Predicted	1.05	103	0.08	0.08	-0.07	0.24	0.30
	FEF 25-75 Pre	2.13	104	0.37	0.17	0.03	0.71	**0.04***
	FEF 25-75 Post	0.91	104	0.16	0.18	-0.19	0.51	0.36
	FEV1/FVC Pre	2.09	104	0.04	0.02	0.00	0.09	**0.04***
	FEV1/FVC Post	2.03	104	0.04	0.02	0.00	0.07	**0.04***

Table 3: Obstruction among Bhil and Mahadev Kolis based on FEV1/FVCPre<0.75 summer

		Bhil						M. Koli					
		Obstruction		No Obstruction		Total	P value	Obstruction		No Obstruction		Total	P value
		N	%	N	%			N	%	N	%		
Material use for construction of house	Wood / straws	5	17.24	24	82.76	29	0.08^{NS}	3	12.50	21	87.50	24	0.06*
	Stones	0	0.00	1	100.00	1		6	17.14	29	82.86	35	
	Bricks plaster with mud	0		0		0		2	12.50	14	87.50	16	
	Bricks plaster with soil and reti	1	100.00	0	0.00	1		0		0		0	
	Bricks	1	50.00	1	50.00	2		0		0		0	
	Bricks plaster with cement	1	25.00	3	75.00	4		2	11.76	15	88.24	17	
	mud plastered with cow dung	0		0		0		0	0.00	2	100.0	2	
Total rooms in house	1	2	20.00	8	80.00	10	0.81^{NS}	1	11.11	8	88.89	9	0.92^{NS}
	2	3	17.65	14	82.35	17		4	12.50	28	87.50	32	
	3	0	0.00	4	100.00	4		2	20.00	8	80.00	10	
Roof type of Houses	Straws	0	0.00	2	100.00	2	0.28^{NS}	0	0.00	1	100.0	1	0.86^{NS}
	Clay tile	2	9.09	20	90.91	22		7	14.89	40	85.11	47	
	Metal sheet	0		0		0		0	0.00	3	100.0	3	
	Wooden + Clay tile	0	0.00	1	100.00	1		0		0		0	
	Clay tile + Asbestos sheet	2	50.00	2	50.00	4		0		0		0	
	Clay tile + Metal sheet	1	50.00	1	50.00	2		0		0		0	
Separate Kitchen	Yes	1	16.67	5	83.33	6	0.02*	3	21.43	11	78.57	14	0.37^{NS}
	No	4	16.00	21	84.00	25		4	10.81	33	89.19	37	
Ventilation in Kitchen	1 open tile	0		0		0	0.73^{NS}	0	0.00	1	100.0	1	0.84^{NS}
	Eaves places	5	16.13	26	83.87	31		7	14.29	42	85.71	49	
	No ventilation	0		0		0		0	0.00	1	100.00	1	

P values of FEV1/ FVC pre and Post-test underlines the significant difference between respiratory healths of women from both the tribes during rain. P values of FVC too gives the same fact of differences in climatic conditions and impact on respiratory tract.

Association of Obstruction and Housing Pattern

Houses of Mahadev Kolis were made up of mud floor, mud walls and tiled roof. Traditionally, the house of an average Mahadev Koli family consists of two or three rooms (Ghurye 1963). It is either rectangular or square in shape. The walls were of *karvi* sticks plastered with mud and cow dung on both sides. The roofs were either thatched with grass or have tiles. In case it was a single room structure, a partition of *karvi* sticks divides the room into two parts; the rear one was used as a kitchen and the front one for all other purposes. Sometimes they had separate shade for cattle.

This housing pattern still exists. But the *karvi* sticks were replace by mud walls, sometimes bricks also. Houses had one entry door and exit door. Not a single window was constructed in the house. Houses of Bhils were made up of woven wooden sticks. Sometimes those were thatched with mud. A construction in a big square or rectangle shape serves is a place for house. In some houses kitchen is separated with a partition of same material, used for walls. Houses do not have windows. All houses have single door but in some houses two doors were observed. This type of housing pattern may contribute in the high concentration of indoor air pollution.

Upper air ways obstruction has been observed between Bhil and Mahadev Kolis during summer (Table 3). Observed obstruction is very less among both the tribes. It is observed among Bhils (17.24%) who used wood/ straws thatched with mud and cow dung. On the other hand, obstruction is observed in Mahadev Kolis who had stone walls. Material used for wall is significantly associated with obstruction in both the tribes. No significant difference is observed among Bhils (p value = 0.08) and Mahadev Kolis (p value = 0.06). Maximum households from Bhils and Mahadev Kolis had two room houses. Few Bhils had 3 rooms' houses too. Out of all two rooms dwellers, 17.65% Bhils and 12.50% Mahadev Kolis had obstruction in upper airways. No significant difference is observed among Bhils (p value = 0.81) and Mahadev Kolis (p value = 0.92). Similar to other parameters, use of clay tile for roof is common among both tribes. In terms of roof type, more, 14.89% Mahadev Koli respondents who use clay tile had more obstruction in upper airways during summer. Among Bhils very less percent of respondent had obstruction during summer that had separate kitchen and only 4 (16%) respondent had obstruction who didn't had separate kitchen. Alike Bhils, Mahadev Kolis showed a similar situation. There were a significant difference among Bhils (p value = 0.02) and Mahadev Kolis (p value = 0.37). Availability of separate kitchen and obstruction is positively correlated among Bhils (p value = 0.02). Both the tribe had eaves places for ventilation. Out of all Bhils, 5 (16.13%) and Mahadev Kolis, 7 (14.29%) had prevalence of upper airways obstruction who had provision of eaves places. No significant difference is observed in Bhils (p value = 0.73) and Mahadev Kolis (p value = 0.84). No significant association between place of livestock and obstruction found in both tribes. In addition, no significant difference exists between Bhils (p value = 0.34) and Mahadev Kolis (p value = 0.29).

Uniformity is seen in terms of material used for building houses among Bhils. Very few different types were observed, which was based on availability of materials. At Ahupe, a Mahadev Kolis village, mixed type of housing pattern is observed, which is based on economic structure due to exposure of modern construction pattern and material. The government ashram schools, is also constructed with modern pattern in cement and RCC structure. But at the same time old pattern of construction is maintained. Even after such additional changes, more dampness in walls of houses (in village 'Ahupe') is observed. This is because of geographical location; 'Ahupe' remains cover with clouds for a long time during rainy season and rain water trails flows inside the wall.

Table 4: Obstruction among Bhil and Mahadev Kolis based on FEV1/FVCPre<0.75 Rain

		Bhil						M. Koli					
		Obstruction		No Obstruction		Total	P value	Obstruction		No Obstruction		Total	P value
		N	%	N	%			N	%	N	%		
Material use for construction of house	Wood / straws	4	13.79	25	86.21	29	0.33NS	3	12.50	21	87.50	24	0.01**
	Stones	0	0.00	1	100.0	1		4	11.43	31	88.57	35	
	Bricks plaster with mud	0		0		0		4	25.00	12	75.00	16	
	Bricks plaster with soil and reti	0	0.00	1	100.00	1		0		0		0	
	Bricks	1	50.00	1	50.00	2		0		0		0	
	Bricks plaster with cement	1	25.00	3	75.00	4		0	0.00	17	100.00	17	
	mud plastered with cow dung	0		0		0		0	0.00	2	100.00	2	
Total rooms in house	1	2	20.00	8	80.00	10	0.78NS	0	0.00	9	100.0	9	0.01**
	2	2	11.76	15	88.24	17		4	12.50	28	87.50	32	
	3	0	0.00	4	100.0	4		2	20.00	8	80.00	10	
Roof type of Houses	Straws	1	50.00	1	50.00	2	0.25NS	0	0.00	1	100.0	1	0.01**
	Clay tile	1	4.55	21	95.45	22		6	12.77	41	87.23	47	
	Metal sheet	0		0		0		0	0.00	3	100.0	3	
	Wooden + Clay tile	0	0.00	1	100.00	1		0		0		0	
	Clay tile + Asbestos sheet	1	25.00	3	75.00	4		0		0		0	
	Clay tile + Metal sheet	1	50.00	1	50.00	2		0		0		0	
Separate Kitchen	Yes	1	16.67	5	83.33	6	0.09NS	2	14.29	12	85.71	14	0.66NS
	No	3	12.00	22	88.00	25		4	10.81	33	89.19	37	
Ventilation in Kitchen	1 open tile	0		0		0	0.33NS	0	0.00	1	100.00	1	0.87NS
	Eaves places	4	12.90	27	87.10	31		6	12.24	43	87.76	49	
	No ventilation	0		0		0		0	0.00	1	100.00	1	

Upper air ways obstruction has been observed between Bhil and Mahadev Kolis during rain (Table 4). Among Bhils, 14 (13.79%) respondents had prevalence of obstruction that had wood and straw walls thatched with mud and cow dung. As discussed earlier, Mahadev Koli had different material used for construction and out of all that, 11.43% to 25% respondent had obstruction. Significant association observed in material used and obstruction among Mahadev Kolis (p value = 0.01). Significant difference exists in Bhils (p value = 0.33) and Mahadev Kolis.

In Bhil tribe, 11.7% to 20 % respondent showed prevalence of obstruction in upper airways during rain who were residing in one or two rooms houses. Among Mahadev Kolis, two and three room dwellers showed prevalence of obstruction, which was 12.5% to 20 %.

Number of rooms house had and obstruction were significantly associated among Mahadev Kolis during rain (p value = 0.01). Significant difference was observed among Bhils (p value = 0.78) and Mahadev Kolis. Both tribes did used clay tiles for roof majorly. Out of all types of roof material very less Bhil respondents showed prevalence of obstruction, whereas, 6 (12.77%) Mahadev Kolis had obstruction in upper air ways during rain. Material used for roof and obstruction was significantly associated among Mahadev Kolis (p value = 0.01), whereas Bhils did not had such association (p value = 0.25). Both the tribes experience similar prevalence of obstruction in terms of availability of separate kitchen. Considerable difference is observed in Bhils (p value = 0.09) and Mahadev Kolis (p value = 0.66).

In terms of ventilation, during rain, 12.9% Bhils and 12.24% Mahdev Kolis showed prevalence of obstruction that had eaves places as ventilating means. No significant difference is observed among Bhils (p value = 0.33) and Mahadev Kolis (p value = 0.87). No significant association was observed between place of livestock and obstruction in Bhils (p value = 0.59) and Mahadev Kolis (p value = 0.14). Not as much of respondent with obstruction were observed, only among Mahadev Kolis, respondent who kept livestock inside the house had slightly higher percentage of obstruction (33.33%).

Discussion

Housing pattern and indoor air quality among Bhils and Mahadev Kolis are significantly different. As mentioned above, they follow rudimentary housing pattern, so the material they used for construction is different. No significant association with airways obstruction is found with the material used for housing among Bhil respondents. This is because; Bhils use wood or straws to build their houses which give small pores in the walls, which plays an important role of ventilation (Nath 1960). There is no solid research is done and available which will underline the association of housing pattern and respiratory health. Unavailability of separate kitchen among most of the Bhil houses in village Savar has been associated with the obstruction in upper airways in both the season. Similar findings were given in study conducted by Kilabuko et al. where they states that, kitchen location seemed to have an effect on levels of all the pollutants monitored except CO. PM10 and NO2 concentrations were higher in indoor kitchens located in the living room, which by nature were poorly ventilated compared to other locations (Kilabuko et al. 2007).

On the other hand, Mahadev Kolis, who use mud, stone or bricks wall plastered with mud or cement for construction having no pores, have obstruction in upper airways in summer as well as rain. Thus, the observation is the village ‘Ahupe’ of Mahadev Koli have more windows on internal walls than village ‘Savar’ of Bhils. Like difference in patterns of door, both the tribes follow different trends in terms of total number of doors and their positioning. James H Kilabuko, Hidieki Matsuki and Satoshi Nakai in their article conclude that Particulate Matter 10 concentrations were higher in indoor kitchens located in living room. Cooking is safer outside the house taking health effects into consideration (Kilabuko et al. 2007). The findings of the present study and Kilabuko et al. study are quiet correlated that cooking inside the house having poor ventilation can impact respiratory

health of women. Women get complete exposure of smoke out of cooking fire. The results reported in our study related with the housing do match with the findings in study conducted by Rumchev et al. but not matches with findings related with socioeconomic factors (Babu 2012; Rumchev et al. 2017). Our study population is tribal who follows rudimentary housing by choice out of location where socio economic factors has no significant impact. Solutions like bringing behavioural changes through Education, bringing Schemes like Pradhan Mantri Ujjwala Yojana (Kumar and Ram 2017) may help reducing the impact of indoor air pollution.

Conclusion

Village Ahupe is located at a hill top and has dense cloudy climate during rainy season, which leads to dampness. Because of this, though maximum Mahadev Koli houses have more than 1 room, a significant association is seen in total number of rooms available and obstruction in upper air ways. All Bhil and Mahadev Koli respondents use clay tile for roofing but because of dense moist climate, obstruction is seen significantly associated with roof type among Mahadev Kolis. Availability and type of eaves places do not play a significant role in congestions observed in smaller as well as upper airways among both the tribes during both the seasons.

Hence, this study concludes that major factors leading to COPD and other respiratory illnesses are construction type, construction material, dampness in wall, wet firewood, use of dung cakes for cooking and use of kerosene for lightning purpose. In tribal areas, climatic conditions in association with the above mentioned factors play a crucial role in respiratory health. Phlegm, strong headache and breathlessness are major symptoms observed for prevalence of the airways obstruction.

Conflict of Interest

There is no conflict of interest of any kind regarding this manuscript.

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