IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 5 Ver. VI (May. 2016), PP 13-16
www.iosrjournals.org

Environmental Tobacco Smoke and Cooking Smoke As Risk Factors of Childhood Asthma: A Tertiary Hospital Based Study

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Abstract
Introduction: *Second hand tobacco smoke exposure is a risk factor for asthma. Also use of open fire for cooking purpose is a significant risk factor for asthma symptoms. Asthma is a prevalent disease in Sub-Himalayan Terai Region of North Bengal and so is the presence of smoking habit and use of smoke emitting biomass fuel for cooking. Therefore this study has been carried out to know the prevalence and risk of environmental tobacco smoke and cooking smoke exposure in childhood asthma patients.*
Methods: *Patients of 3-12 years of age presented with asthma symptoms to our institute, were tested for reversibility (PEFR) and /or variability wherever feasible, were given anti-asthma drug trial and were followed up to observe the improvement and thus were diagnosed as childhood asthma excluding other differential diagnoses. In the present study, a total of 94 children with asthma were studied. After matching for age and sex 94 healthy children were included in the control group. History was taken about exposure of environmental tobacco smoke and smoke emitting from biomass fuel combustion of both groups.*
Results: *The chance of having asthma was found to be 2.12 times more among the children exposed to tobacco smoke, compared to children without tobacco smoke exposure in their families (OR=2.12, 95% CI=1.13-4.00) and it was statistically significant (p=0.012). The chance of having asthma was found to be 2.22 times greater among the children having cooking mode with emission of smoke in contrast to children without having cooking mode with emission of smoke in their families (OR=2.22, 95% CI=1.13-4.39) and this was proven significant statistically (p=0.0123).*
Conclusion: *Children living in this Sub-Himalayan Terai region of North Bengal have an increased risk of having asthma due to increased exposure of passive smoking and household cooking smoke. This study may focus on community education on the harmful effect of tobacco smoke and cooking smoke exposure among children so that corrective measures may be taken.*
Keywords: *Asthma, childhood asthma, cooking smoke, environmental tobacco smoke, risk factors*

I. Introduction

Asthma is an inflammatory condition of the bronchial airways.[1] Second hand smoke exposure is a risk factor for new asthma cases. Recent studies have suggested that children of smokers are twice as likely to develop asthma as the children of nonsmokers.[2,3,4] Household environmental tobacco smoke exposure among children vary from 27.6% to 77.8%.[5] Also prevalence of all the symptoms of asthma is higher in children from households using open fires compared to improved stoves with chimneys. Use of open fire for cooking purpose is a significant risk factor for asthma symptoms.[6]

Asthma is a prevalent disease in Sub-Himalayan Terai Region of North Bengal and so is the presence of smoking habit and use of smoke emitting biomass fuel for cooking . But there are not much data of environmental tobacco smoke exposure (ETS) and cooking habit with smoke emitting fuels like wood, leaves, coal, dried animal dung, agricultural residues such as straw and sticks, etc in this region. So passive smoking and cooking smoke exposure may be important risk factors for childhood asthma in North Bengal Terai region.

Therefore a tertiary hospital based case control study has been proposed to know about the status of smoking habit and cooking smoke in the families of childhood asthma patients and control group and to find out the risk if any.

II. Materials And Methods

Proper permission from the ethical committee was taken before doing this study and proper history and clinical examination findings were written in typed proforma in OPD and inpatient department also after getting proper written consent from the guardians of the children. Normal healthy children who are the neighbors of the patients were taken as control only after getting written consent from the guardians. This tertiary hospital based case control study was carried over one year (from 1st February, 2009 to 31st January, 2010) in the Department of Pediatrics, North Bengal Medical College & Hospital, Darjeeling, West Bengal, India and the drainage area

of the study population is North Bengal Terai Region which includes Cooch behar, Jalpaiguri & Terai area of Darjeeling district.

Selection of cases: Patients of 3-12 years of age presented to OPD or inpatient department with clinical signs and symptoms of asthma were tested for reversibility (PEFR) and/ or variability wherever feasible, given anti-asthma drug trial and were followed up to observe the improvement and history of allergens and triggers were taken and thus diagnosed as asthma after excluding other important differential diagnoses. The Children belonging to North Bengal Terai region in the age group of 3 years to 12 years presented with pulmonary symptoms which are due to any acute or chronic illness other than asthma were excluded from the study group. Patients having both asthma as well as any acute or chronic illness other than asthma were excluded from the study group.

Selection of Control: The healthy children (3 years to 12 years) of the above mentioned drainage area, who are neighbors of the patients visiting the OPD or inpatient department and who did not have any infections of respiratory tract or any pulmonary diseases or any known diseases which might impair pulmonary function and alter other parameters of the study, were included in this study after getting written consent. Any children having any kind of respiratory illness or any other illnesses which might affect the clinical and laboratory criteria of asthma were exclude from the study.

History of ETS exposure at home or school among asthmatic children and control group (yes/no) due to tobacco smoking by mother/ father or any other persons other than parents was recorded. Also history was taken about household cooking habit with smoke emitting biomass fuel (yes/ no) of both groups.

The collected data edited and entered into excel sheet 2010 Beta and analyzed by using SPSS version 16 software and Epi Info software. Findings were tabulated in frequency distribution tables and the risk factors were analyzed by calculating exposure rate in cases and control group. Odds Ratio was also calculated for individual risk factors. Exposure rate of different risk factors of cases and controls was compared by using chi-square test for qualitative data. P value <0.05 was considered as significant statistically.

III. Results And Analysis

In the present study, a total of 94 children aged 3 to 12 years (Mean age = 6.97 years) with childhood asthma were studied. There were 54 male patients and 40 female patients. One hundred forty one normal children, who were neighbors of the patients, were selected at first. Among them 31 children did not fulfill the inclusion criteria of control group so they were excluded from the study. From the remaining one hundred and ten healthy children, after matching for age and sex 94 children were included in the control group.

Table 1: Environmental Tobacco Smoke Exposure

			Environmental tobacco smoke exposure (ETS)		Total
			Absent	Present	
Groups	Asthma (n=94)	Count	46	48	94
		% within group	48.9%	51.1%	100.0%
	Control (n=94)	Count	63	31	94
		% within group	67.0%	33.0%	100.0%
Total		Count	109	79	188
		% within group	58.0%	42.0%	100.0%

Table no.1 depicts that 51.1% asthma patients were exposed to environmental tobacco smoke in their families in comparison with 33% patients in the control group. So the difference of presence of environmental tobacco smoke exposure in asthma and control group was found to be significant statistically (χ^2=6.31, p=0.012). The chance of having asthma was found to be 2.12 times more among the children exposed to tobacco smoke, compared to children without tobacco smoke exposure in their families (OR=2.12, 95% CI=1.13-4.00).

Table 2: Cooking Modes In The Families Of Asthmatics And Controls

			Cooking mode		Total
			Smokeless	With smoke	
Group	Asthma (n=94)	Count	22	72	94
		% within group	23.4%	76.6%	100.0%
	Control (n=94)	Count	38	56	94
		% within group	40.4%	59.6%	100.0%
Total		Count	60	128	188
		% within group	31.9%	68.1%	100.0%

Table no.2 shows that cooking fuels with emission of smoke were present in 76.6% families of asthma patients and 59.6% families of control group and this difference was significant statistically (χ^2=6.27, p=0.0123). The chance of having asthma was found to be 2.22 times greater among the children having cooking

mode with emission of smoke in contrast to children without having cooking mode with emission of smoke in their families (OR=2.22, 95% CI=1.13-4.39).

IV. Discussion

Various studies reported different percentage of prevalence of environmental tobacco smoke exposures. In an Indian study the prevalence of household tobacco smoke exposure due to smoking by parents and other family members, was higher in asthmatic group as compared to non-asthmatics (41% vs. 28%, $p < 0.0001$).[7] In another study the prevalence of household environmental tobacco smoke (ETS) exposure among asthmatic children vary from 27.6% to 77.8%.[5] From a study in Taiwan the prevalence of household ETS exposure among asthmatic children was reported 49.0% at any time during their lives, and 44.9% current household ETS exposure.[8] The prevalence of ETS exposure of 80.0% was reported in a recent study in a Chinese Population.[9] So our findings of the prevalence of household ETS exposure (51.1%) among the asthmatic children is comparable with different studies.

In an Indian study the odds ratio for being asthmatics who were exposed to environmental tobacco smoke, compared to unexposed asthmatics was 1.78 (95% confidence interval 1.33–2.31).[7] In another study from the state of Haryana in India, passive smoking was an important risk factor of asthma (OR 3.33, 95% CI = 1.85–7.65).[10] In a meta-analysis of the effects of household ETS on asthma and wheeze, reported a summary relative risk for asthma of 1.21 (OR=1.21, 95% CI 1.17-1.26).[11] In a study in Taiwan in 2010 the association between household ETS and active asthma was 1.39 (OR=1.39, 95% CI 1.00-1.93). Joint exposure to parental smoking showed a significant effect on early-onset asthma (OR, 2.01; 95% CI, 1.00-4.02).[8] In a study in Nepal the association of asthma with cigarette smoking by two or more family members was established (OR 1.9 (95% CI 1.0 to 3.9, p=0.06).[12] Therefore the odds ratio (OR=2.2, 95% CI=1.13-4.00) for being asthmatics who were exposed to environmental tobacco smoke, compared to unexposed asthmatics in our study is supported by various studies.[7,8,11,12]

Sing et al observed that smoke producing fuels (wood, cow dung, kerosene, etc.) were used by 69% of families of asthmatic children in comparison to 62% in the control group ($p>0.05$).[13] Melsom et al reported that among the families 34% families used open fire or burning stoves without a flue (with solid fuel such as wood and grass), 18% of families used gas stoves and 43% families used kerosene stoves for cooking. Among the children 26% children had been bothered by smoke coming from the cooking place.[12] In our study cooking fuels with emission of smoke were present in 76.6% families of asthma patients and 59.6% families of control group and this difference was significant statistically ($\chi^2=6.27$, $p=0.0123$). This findings of our study is comparable with findings reported in different literature.[12,13]

Use of open fire for cooking was a significant risk factor for a number of asthma symptoms, with odds ratios varying from 2.0 to 3.5.[6] Significantly increased risk of childhood asthma was associated with the use of coal for heating (OR = 1.5, 95 percent CI: 1.1, 1.9). Using coal for cooking without ventilation had a significantly increased risk (OR = 2.3, 95 percent CI: 1.5, 3.5).[14] An eastern Indian study showed a strong association of asthma with use of biomass as fuel.[15] Another study showed that the role of indoor cooking fuel may only be relevant in regions where the outdoor air is relatively cleaner.[16] A study showed lifetime exposure to cooking coal smoke and when the exposure was categorized as light, moderate or heavy exposure, no differential association with asthma was found.[17] In our study the chance of having asthma was found to be 2.22 times greater among the children having cooking mode with emission of smoke in contrast to children without having cooking mode with emission of smoke in their families (OR=2.22, 95% CI=1.13-4.39).

V. Conclusion

It is concluded that children living in this Sub-Himalayan Terai region of North Bengal have an increased risk of having asthma due to increased exposure of passive smoking and household cooking smoke. A focus on community education on the harmful effect of tobacco smoke and cooking smoke exposure may mobilize demand for controlling of passive smoking, installation of improved stoves and good household ventilation. This demands long term multi-center further study on large sample.

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