ORIGINAL ARTICLE

Risk factors associated with childhood asthma in District Mardan, Pakistan

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Abstract

Objective: To estimate the prevalence of asthma in children aged <10 years, and to identify important risk factors for asthma.

Methods: The case-control study was conducted at Mardan Medical Complex and District Head Quarters Hospital, Mardan, Pakistan, from June to September 2017. Data was collected from paediatric patients of asthma as well as healthy controls through a self-designed questionnaire. SPSS 19 was used for data analysis.

Results: Of the 647 subjects, 349(54%) were asthmatic cases and 298(46%) were controls. Among the cases, 201(57.6%) were females, while 148(42.4%) were males. There were 332(51%) subjects whose fathers were smokers, and of them 224(67%) had asthma and 125(37%) were non-asthmatic. Overall, 323(50%) subjects had carpet in their rooms, and of them 221(68%) had asthma. Among other risk factors, subjects aged <5 years had 1.49 time more likely to have asthma with (odds ratio: 1.49, 95% confidence interval: 0.963-1.988).

Conclusions: Female gender, fathers' smoking, having carpet in the room and age <5 year were found to be the main risk factors associated with asthma.

Keywords: Asthma, Risk factors, Parent's awareness, Smoking, Logistic regression. (JPMA 69: 1767; 2019)

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Introduction

Childhood asthma is the most common enduring respiratory disease among different groups of children. Asthma occurrence and allergies as a whole has risen significantly over the last few decades, especially in children. The occurrence of asthma globally is variable. For example, among the age group 6-7 years, the occurrence of wheezing was recorded 4.1% in Indonesia, while the prevalence was found 32.1% in Costa Rica.[1] Similarly in Brazil, the existence of asthma was 7.3% in male children and 4.9% in female children of similar age and 9.8% and 10.2% in the 13-14 years age group.[2] The number of people suffering from this disease varies in different parts of the world.[3] In the mid of 2007 and 2009, a study conducted in Riyadh showed 11.4% asthma prevalence in children aged 6-14 years.[4] Similar findings were found in Oman where asthma prevalence reached 10.5% in age group 6-7 and 20.7% in age group 13-14 years.[5] In a recent study, the incidence of asthma in different regions of India varied between 4% and 20%.[6] Regarding the prevalence of asthmatic children in Pakistan, a survey was conducted in 1997 which indicated that 10% of children were suffering from this disease. The study was repeated in 2006 and the results revealed that the prevalence of asthma had risen to 18% in children aged 13-14 years.[7]

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Asthma often occurs during the night, before waking up in the morning or during/after activity. The symptoms are caused by the problem in airways.[8] One study conducted in Karachi in 2007 showed that the estimated occurrence of doctor-identified asthma was 15% in school-going children aged 3-16 years.[9]

Asthma has a comprehensive variety of prospective factors fluctuating from hereditary elements to lifestyle and demographic factors. Indoor home atmosphere is of particular interest as most of the children globally spend a large portion of their time at home.[10] According to data collected by the Global Initiative for Asthma (GINA), the estimated occurrence due to asthma currently in Pakistan is 4-5%.[11] Despite recent advances in the field of allergy medicine, more and more people are suffering from the disease and that is so because of the fact that there is little awareness about asthma in the developing countries, including Pakistan. Many factors have been shown to influence asthma ranging from genetic to environmental factors, and from family history to meteorological events. The current study was planned to identify the most significant risk factors related with childhood asthma.

Subjects and Methods

The case-control study was conducted at Mardan Medical Complex and District Head Quarters Hospital, Mardan, Pakistan, from June to September 2017, and comprised patients along with controls under 10 years of age who were admitted to the two hospitals. After approval from the research board of the Islamia College University, Peshawar, Pakistan, the sample size was determined by

using G*Power 3.1 software,[12] keeping type-1 error of 0.05 and power of the test (1-β) 0.8. The sample was raised using non-probability convenient sampling technique.

The cases and the controls included in the sample had identical characteristics, except asthma status. A standard self-designed questionnaire was used for data collection, including details of risk factors like age, gender, family history, residence, smoker at home and awareness, home pets etc. after getting informed consent from the parents of the subjects. Clinical examination was carried out, and results of relevant investigations, including pulmonary function tests and sputum examination, were recorded.

Fathers' smoking was labelled if the patient's father had smoked frequently within the preceding 2 years. Family history of asthmatic disease was considered positive when any close family member <15 years of age had history of asthma. A pet in the home was labelled if the family had kept it for the preceding 2 years.

SPSS 19 was used to analyse the data. Chi-square test was conducted. Binary logistic regression was used because of the categorical (dummy) nature of the dependent variables, and the qualitative nature of the independent variables. A stepwise logistic regression is a combination of forward selection and backward elimination procedure which performs better than these two methods. This procedure takes start with a null model, a model having no predictor variable and includes variables one by one depending upon their significance. At each step, a variable entered into the model is checked for its significance along with the already included variables. If, with the inclusion of a new variable, the already entered variable becomes insignificant, it is dropped from the model. This process is repeated until a final model is selected. In this study all the potential variables under study were entered e.g. age, gender, family history, smoking etc. The stepwise logistic regression evaluated the variables one by one, checked its significance and the variables age, gender, residence, awareness, smoking, pets/cockroaches/rates, matt/pillow cover, and carpet were selected for the final model, dropping the rest of the variables that were insignificant.

Logit (p) = 0.399 age - 0.801 gender - 0.823 residence - 0.669 awareness + 1.092 Smoking - 0.596 Pets/cockro/rates + 0.511 matt/pillow cover + 1.122 carpet

A risk factor with $p<0.05$ was considered statistically significant.

Results

Of the 647 subjects, 349(54%) were asthmatic cases and 298(46%) were controls. Among the cases, 201(57.6%) were females, while 148(42.4%) were males. There were 332(51%) subjects whose fathers were smokers, and of them 224(67%) had asthma and 125(37%) were non-asthmatic. Overall, 323(50%) subjects had carpet in their rooms, and of them 221(68%) had asthma. Gender had a significant association with asthma ($p<0.001$). The prevalence of asthma was significantly higher in rural than in urban areas ($p<0.001$). Different home types had no significant association with asthma ($p=0.63$). Low parental awareness was associated with high frequency of asthma ($p<0.001$). The occurrence of asthma was higher among children who had a smoker in their home compared to those who had none ($p<0.001$). The other risk factors were also analysed (Table-1).

Table-1: Asthma risk factors.

Factors	Group	Asthma		Chi-Sq	P-value
		Cases (%)	Control (%)		
Age	<5 years	173(55.8)	137(44.2)	0.83	0.361
	>5 years	176(52.2)	161(47.8)		
Gender	Male	148(44.9)	181(55.1)	21.61	0.000**
	Female	201(63.2)	117(36.8)		
Residence	Urban	189(46.8)	214(53.2)	21.33	0.000**
	Rural	160(65.6)	84(34.4)		
Home type	Katcha	104(53.8)	89(46.2)	0.89	0.638
	Pakka	111(51.6)	104(48.4)		
	Semi-P	134(56.1)	105(43.9)		
Parents awareness	Yes	109(42.4)	148(57.6)	22.80	0.000**
	No	240(61.5)	150(38.5)		
Father Smoking	Yes	224(67.5)	108(32.5)	50.23	0.000**
	No	125(39.7)	190(60.3)		
Family history	Positive	151(66.2)	77(33.8)	19.39	0.000**
	Negative	198(47.2)	221(52.8)		
House with veranda	Yes	197(58.8)	138(41.2)	6.61	0.010*
	No	152(48.7)	160(51.3)		
Living room	Vent.	188(53.1)	166(46.9)	0.21	0.640
	Non-ven	161(54.9)	132(45.1)		
House with sunlight	Yes	116(47.5)	128(52.5)	6.45	0.011*
	No	233(57.8)	170(42.2)		
Pets/Cockroach/Rates etc.	Yes	92(45.7)	109(54.3)	7.83	0.005**
	No	257(57.6)	189(42.4)		
Mattress/pillow cover	Yes	117(57.1)	88(42.9)	1.18	0.276
	No	232(52.5)	210(47.5)		
Carpet	Yes	221(68.4)	102(31.6)	54.43	0.000**
	No	128(39.5)	196(60.4)		
	No	206(50.6)	201(49.4)		

Stepwise logistics model identified children aged <5 years had 1.49 times more likely to have asthma (95% Confidence Interval [CI]:0.963-1.988). The factors that no longer remained significant in multivariate analyses from univariate analyses were home type, family history, house with veranda, ventilated room and house with

Table-2: Multivariate/logistic regression analysis.

Variable	Coeff.	S.E.	OR	P-value	95%	CI
Age	0.399	0.193	1.49*	0.038*	0.96	1.98
Gender	-0.801	0.192	0.48*	0.000**	0.33	0.68
Residence	-0.823	0.200	1.48*	0.000**	1.32	1.69
Awareness	-0.669	0.192	2.52*	0.000**	1.36	2.74
Smoking	1.092	0.188	3.19*	0.000**	2.21	4.49
Pets/cockro/rates etc	-0.596	0.208	1.16*	0.004**	0.78	1.72
Matt/pillow Cover	0.511	0.211	1.67*	0.015**	1.25	2.79
Carpet	1.122	0.192	3.35*	0.000**	2.26	4.97

Coeff: Coefficient
SE: Standard error
OR: Odds ratio
CI: Confidence interval.

sunlight (Table-2).

Discussion

Asthma is a common disease and normally happens in early years of life. Consistent with literature, our findings indicated socio-demographic factors had great impact on the child's asthma. To summarise socio-demographic variables were the key cause of asthma prevalence. Most significant among them was gender.[13] One possible reason for gender susceptibility may be the gender-specific difference in environmental exposure and social cultural trends in the region where female newborne are not heartily accepted and given due attention.

The residence was another variable significantly impacting asthma prevalence. Environmental conditions are truly different in rural and urban areas, such as dust, pollen and lack of adequate sanitation. The findings of this study in this regard are in agreement with earlier studies carried out in different parts of the world.[14-17]

Children with lesser parental awareness showed a higher prevalence of asthma may be because of lack of parent's education or poverty.[18] Among the risk factors examined, environmental factors, particularly exposure of children to cigarette smoke, were found to be significant. This result is in agreement with published studies which showed that the prevalence of asthma rises with the exposure of children to parental smoking.[19-22] However, some studies failed to find such an association.[23-25]

The current study revealed that exposure to sunlight at home was a non-significant factor in asthma prevalence. The result is in disagreement with previous studies.[18,26] It was also identified in the study that the presence of pets/rates/cockroaches was a significant major predictor for childhood asthma. Cockroaches' allergen had a significantly larger inhibition rate of binding to house dust mite allergens in district Mardan.[27] Wall-to-wall carpet in the room can be a reservoir for allergy-causing substances. The current study found significant difference in asthma prevalence between children living in carpeted rooms compared to non-carpeted rooms. Different results have been found in other studies on the same subject.[28-30]

Conclusion

Age, gender, residence, parental awareness, fathers' smoking, pets/cockroaches etc, mat/pillow cover, and the presence of carpet were found to be strongly associated with asthma.

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