

## Risk factors of childhood asthma in children attending Lyari General Hospital

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### Abstract

**Objective:** To determine the factors associated with asthma in children.

**Methods:** The case-control study was conducted in the paediatrics clinic of Lyari General Hospital, Karachi, from May to October 2010. Children 1-15 years of age attending the clinic represented the cases, while the control group had children who were closely related (sibling or cousin) to the cases but did not have the symptoms of disease at the time. Data was collected through a proforma and analysed using SPSS 10.

**Results:** Of the total 346 subjects, 173(50%) each comprised the two groups. According to univariable analysis the risk factors were presence of at least one smoker (odds ratio: 3.6; 95% confidence interval: 2.3-5.8), resident of kacha house (odds ratio: 16.2; 95% confidence interval: 3.8-69.5), living in room without windows (odds ratio: 9.3; 95% confidence interval: 2.1-40.9) and living in houses without adequate sunlight (odds ratio: 1.6; 95% confidence interval: 1.2-2.4). Using multivariable modelling, family history of asthma (odds ratio: 5.9; 95% confidence interval: 3.1-11.6), presence of at least one smoker at home (odds ratio: 4.1; 95% confidence interval: 2.3-7.2), people living in a room without a window (odds ratio: 5.5; 95% confidence interval: 1.15-26.3) and people living in an area without adequate sunlight (odds ratio: 2.2; 95% confidence interval: 1.13-4.31) were found to be independent risk factors of asthma in children adjusting for age, gender and history of weaning.

**Conclusion:** Family history of asthma, children living with at least one smoker at home, room without windows and people living in an area without sunlight were major risk factors of childhood asthma.

**Keywords:** Childhood asthma, Risk factors, Inadequate sunlight, Smoker, Residence. (JPMA 65: 647; 2015)

### Introduction

Childhood asthma is the most common chronic pulmonary disease of children<sup>1</sup> and it causes considerable morbidity.<sup>2</sup> Several international studies have shown an increased prevalence of allergic respiratory diseases worldwide, particularly among children in Western countries.<sup>3</sup> In USA prevalence of asthma was found to be 12.1%.<sup>2</sup> Higher prevalence of 13.1% was reported in England.<sup>4</sup> The prevalence of asthma in different parts of India is reported between 4-20%.<sup>5,6</sup> In Bangladesh the prevalence was 9.1% among 6-7-years-old children.<sup>7</sup> According to the Global Initiative for Asthma (GINA), prevalence of asthma in Pakistan is 4-5%.<sup>8</sup> A recent study shows that the prevalence of allergies and asthma in Karachi is 15.8%.<sup>9</sup> Epidemiological studies indicate that the burden of asthma is increasing day to day, but precise reason for this increase is yet unknown. Various studies have been attempted worldwide to determine the risk factors of asthma. However, few studies have been attempted in Pakistan among which two of them were conducted in

Lahore<sup>10,11</sup> while one study was conducted in Hyderabad.<sup>12</sup> In Karachi, a study was done on asthma in adult male tannery workers<sup>13</sup> but no publication was found regarding asthma in children. Therefore, there remains a gap in knowledge regarding the possible risk factors associated with childhood asthma and to see whether or not the risk factors in Pakistan, specially in Karachi, are similar to those found in the developed world.

The current study was planned to identify the risk factors associated with childhood asthma in children attending a Karachi hospital.

### Patients and Methods

The case-control study was conducted at the Paediatrics out-patient department (OPD) of Lyari General Hospital, Karachi, from May to October, 2010.

The sample size was calculated considering power of 80%, alpha of 5% and confidence level (CI) of 95%, while taking proportion (P1)=0.34 and (P2)=0.22. Purposive sampling was employed to pool together the study sample.

All the cases were children between 01 and 15 years

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of age who had been clinically diagnosed as asthmatics and had a history of at least three episodes of wheeze in the preceding 1 year, history of intermittent dry cough, shortness of breath, chest tightness and history of all respiratory symptoms worsening at night.

The controls were children of matching age group visiting the OPD with complaints of loose motion who were living in close vicinity or/and related (i.e. sibling or cousin) to the asthmatic child (the case).

Children outside the age group who were known cases of cardiac disease, cystic fibrosis, bronchiectasis, a bronchiolitis or any chronic illness were excluded, and so were children having foreign body aspiration. Besides, children whose direct caretaker was not available were also excluded.

Among the controls, children who were critically ill (vitally unstable) and required hospitalisation were also excluded.

The dependent study variable in the study was asthma, while risk factors of asthma, including breastfeeding, weaning, family history of asthma, smoking by parents and type of residence, were taken as independent variables.

For the purpose of study, breastfeeding was defined as exclusive breastfeeding up to 6 months of age; weaning was complementary food started after 6 months (appropriate), earlier than 6 months (early weaning) and if not started after 6 months (delayed weaning); smoking was considered positive if there was history of smoking by father, mother, either or both of them; family history was considered positive if there was history of asthma in either mother or father or both. In terms of type of residence, open house was the one that had a veranda beside the room with enough sunlight and passage of air. Covered house was a flat or room without adequate sunlight and air (improper ventilation). At least two windows in the room were considered adequate for ventilation. Also, two children and two adults living in one room were considered adequate, while more than that was considered overcrowded.

A proforma was developed in English keeping in view the variables under each statement which were then translated and explained to parents (or guardians) and their answers were noted.

The collected data was analysed using SPSS 10. Quantitative variables like age, no. of persons per room,

were analysed using mean and standard deviation, and the mean of two groups was compared by student t-test. For qualitative variables, like family history, frequency and percentage were calculated. Chi square was applied to assess the significance of two groups under the qualitative variable. The strength of relationship between risk factors and asthma were evaluated by calculating odd's ratio (OR) and 95% CI for all factors tested. Confounders were controlled by multivariable logistic regression.

## Results

Of the total 346 subjects, 173(50%) each comprised Group A as cases and Group B as controls

In Group A, 105(60.7%) were less than 5 years of age and 97(56.1%) in Group B( $p=0.22$ ).

In Group A, 81(46.8%) were male compared to 95(54.9%) in Group B.

In Group A, 150(86.7%) cases had history of breastfeeding compared to 157(90.8%) in Group B( $p=0.15$ ).

In Group A, 76(43.9%) had started weaning in <6 months of age compared to 109(63%) in Group B ( $p<0.001$ ). Also, Group A had 63(36.4%) cases with family history of asthma compared to 20(11.6%) among Group B controls ( $p<0.001$ ).

Group A had 88(50.9%) subjects with at least one smoker at home compared to 38(22%) in Group B ( $p<0.001$ ). And, in Group A, 167(96.5%) cases were living in kacha houses compared to 134(77.5%) in Group B ( $p<0.001$ ). Also, 137(79.2%) cases were living with >4 people in one room compared to 134(77.5%) among the controls ( $p=0.39$ ). In Group A, 40(23.1%) cases were living in rooms with one window compared to 32(18.5%) in Group B ( $p=0.17$ ). And, 55(31.8%) cases were living in homes without open area compared to 37(21.4%) in Group B ( $p=0.02$ ). Finally, 79(45.7%) Group A cases were living in area without adequate sunlight compared to 98(56.6%) in Group B controls ( $p=0.03$ ). Univariable analysis showed risk factors to be history of at least one smoker (OR: 3.6; 95% CI: 2.3-5.8), resident of kacha house (OR: 16.2; 95% CI: 3.8-69.5) and those living in houses without adequate sunlight (OR: 1.6; 95% CI: 1.2-2.4) (Table-1).

Multivariable modelling identified family history of asthma (OR: 5.9; 95% CI: 3.1-11.6) and at least one smoker at home (OR: 4.1; 95% CI: 2.3-7.2) as independent risk factors of asthma in children adjusting for age, gender and history of weaning (Table-2).

**Table-1:** Multivariable analysis of risk factors of asthma in children.

Risk factors	Case	Control	Odds Ratio (OR)	95% Confidence interval	p-value
<b>Age</b>					
>5 years	105(60.7%)	97(56.1%)	1.2	(0.78-1.85)	0.22
>5 years	68 (39.3%)	76(43.9%)			
<b>Gender</b>					
Male	81(46.8%)	95(54.9%)	1.03	(0.96-1.11)	0.08
Female	92(53.2%)	78(45.1%)			
<b>Breast feeding</b>					
Yes	150(86.7%)	157(90.8%)	0.66	(0.34-1.3)	0.15
No	23(13.3%)	16(9.2%)			
<b>Age of weaning</b>					
<6mths	76(43.9%)	109(63%)	0.46	(0.23-0.71)	<0.001
>6mths	97(56.1%)	64(37%)			
<b>Family history of asthma</b>					
Yes	63(36.4%)	20(11.6%)	4.3	(2.5-7.6)	<0.001
No	110(63.6%)	153(88.4%)			
<b>Smoker at home</b>					
Yes	88(50.9%)	38(22%)	3.6	(2.3-5.8)	<0.001
No	85(49.1%)	135(78%)			
<b>Residence type</b>					
Appts	4(2.3%)	13(7.5%)	16.2	(3.7-69.5)	<0.001
Pakka	2(1.2%)	26(15%)			
Kacha	167(96.5%)	134(77.5%)			
<b>Number of person/room</b>					
<4	36(20.8%)	39(22.5%)	1.12	(0.66-1.84)	0.39
>4	137(79.2%)	134(77.5%)			
<b>Windows/room</b>					
None /one	40(23.1%)	32(18.5%)	1.32	(0.78-2.23)	0.1
>2	133(76.9%)	141(81.5%)			
<b>House with veranda</b>					
Yes	118(68.2%)	136(78.6%)	0.58	(0.36-0.94)	0.02
No	55(31.8%)	37(21.4%)			
<b>House with adequate sunlight</b>					
Yes	94(54.3%)	75(43.4%)	1.5	(1.01-2.3)	0.03
No	79(45.7%)	98(56.6%)			

**Table-2:** Multi-variable analysis of risk factors of asthma in children.

Risk factors	Odds Ratio (OR)	95% Confidence interval
Family history of asthma	5.6	(3.01-10.4)
Smoker at home	4.5	(2.6-7.6)
Type of residence Pakka	0.28	(0.14-0.54)

Model adjusted for age, sex, breast feeding, age of weaning, number of person in one room and home with veranda.

## Discussion

Airway inflammation and bronchial hyper-responsiveness of variable severity form the basis of pathogenesis of bronchial asthma.<sup>14-19</sup> Among the risk factors evaluated, environmental factors, particularly exposure to cigarette smoke<sup>20,21</sup> was also of significant value in our study.

Maternal smoking in pregnancy is also associated with

wheezing.<sup>22-24</sup> However, maternal cigarette smoking is not very common in our setup because of the social values.<sup>25</sup>

Our study found that age, gender and breastfeeding were not associated with asthma in children.

However, family history of asthma, at least one smoker in home, and people living in area without adequate sunlight were risk factors of asthma in children, and early weaning was protective against asthma.

A case-control study in Lahore<sup>11</sup> reported that 56(44.8%) patients gave family history of asthma while only 12(9.6%) children from the control group gave such a history in their families. The OR was 7.64, 95% CI was 3.6-16.25 (p<0.01) and history of worsening of symptoms after exposure to cigarette smoke was reported by 104(83.2%)

children with asthma, whereas only 18(14.4%) controls gave this history. The OR was 29.44 and 95% CI was 14.12-62.35 ( $p<0.01$ ).

The OR in our study was lower because we used cases and controls from the same population.

Another study<sup>10</sup> described results similar to our findings. Overall, 47% children had family history of asthma/allergy, and 41.5% had history of exposure to passive smoking.

There is increasing evidence that substandard housing conditions correlate with high rates of asthma. A study<sup>[15]</sup> found that 81% of asthmatics lived in cramped congested houses.

In our study significant difference of asthma association was found in children living in smaller houses without proper ventilation compared to small houses with ventilation. This may be indirect evidence that living conditions and ventilation status is satisfactory even in lower socioeconomic group in this part of the country. Conflicting data has been found in international studies on this topic. A study<sup>16</sup> from New Zealand found a higher prevalence of wheezing in children from families with low socio-economic status. An Italian study found that urbanisation and socio-economic status had little impact on the prevalence of wheezing or asthma, but might influence the management of asthma.<sup>17</sup>

In a study in Maputo,<sup>18</sup> the subjects were aged between 18 months and 8 years; 60% were male. The asthmatic children were hospitalised more frequently than the non-asthmatic children ( $p<0.0001$ ). Most of the asthmatic children lived in urban areas, had a parental history of asthma, had at least parent who smoked, and were weaned earlier than the non-asthmatic children.

## Conclusion

Exposure to passive smoking, family history of asthma, people living in room without window and without adequate sunlight were proved to be risk significant factors. Further large-scale studies are recommended in Pakistan to define risk factors associated with childhood asthma more precisely.

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