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The prevalence of asthma and allergic conditions among school-aged children.

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ABSTRACT

Objective: This study aimed to ascertain the occurrence of asthma and allergic ailments and determine the associated risk factors in school-aged children.

Methods: A prospective, cross-sectional investigation was carried out from August 2019 to November 2019 involving school-aged children (4-15 years). The study utilized a non-probability purposive sampling approach, and data analysis was conducted using SPSS version 20.

Results: The study found that allergic rhinitis and eczema prevalence among the participants was 22.1%, while asthma prevalence was 14%. Additionally, 34% of the children reported experiencing wheezing in the past 12 months, and 15.5% had food allergies. Predisposing factors included exposure to dust (32.6%), passive smoking (30.8%), perfume odors (27.3%), and pet presence in the household (23.2%). Male gender and maternal asthma showed significant associations with the development of these allergic disorders in children (p-value 0.033).

Conclusion: The research underscores a notable prevalence of allergic disorders and asthma among Karachi's school children. Environmental factors, notably dust exposure and passive smoking, emerged as significant predisposing elements. There is an imperative for further epidemiological investigations to pinpoint high-risk groups and key modifiable factors.

Key Words: Allergic disorders, Asthma, Prevalence

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INTRODUCTION

The prevalence of Asthma and other allergic disorders has increased over the past few decades in many countries. Childhood Asthma often coexists with other atopic diseases and is a major cause of school absence amongst children. Allergic disorders are a group of illnesses linked by a shared underlying problem with the immune system and they are a significant public health burden worldwide [1]

Approximately 60-70% of school children with asthma have been sensitized to one or more allergens. [2] The development of Asthma in children is influenced by interaction between a number of genetic and environmental factors. Results from a number of studies point towards positive association of asthma, wheezing, hay fever and eczema with parental atopy and various environmental allergens [3].

The need for systematic international comparison of the prevalence of asthma and its associated risk factors, led to the International Study of Asthma and Allergies in Childhood (ISAAC) program which aimed to elucidate the prevalence of allergic disorders in children aged 13-14 years and 6 -7 -years - old.[4] The study surveyed around 1.2 million children at 233 centers from 98 countries across the globe. The initial prevalence of self-reported wheezing during the previous 12 months varied from 1.6% to 36.7% in 13 to14 -year- old children in different countries. The corresponding prevalence for parent-reported wheezing in the 6-to-7-year-old children was from 0.8% to 32.1%. Asthma was less prevalent in developing countries as compared to the developed world. [5]. However, the prevalence pattern of allergic disorders in developing countries is showing a rising trend over the past few decades and now more and more cases of childhood asthma are being diagnosed where earlier the prevalence was low. Recent studies report the prevalence of asthma in preschool children in low-income countries to be around 10–15% [6].

According to the ISAAC global study, the prevalence of asthma in Pakistan among school children aged 13–14 years was 8% in 1995 [4]. However in 2007, the estimated prevalence of physician-diagnosed asthma was reported to be 15% in school - going children (3–16 years of age) thus, indicating a rising trend. [7] However, there is paucity of published literature on childhood asthma in Pakistan despite the fact that the burden of asthma is increasing in low-income countries like Pakistan. [8]

Most of the research on allergic disorders however, has been conducted in the developed countries. However, the risk factors identified for these disorders might not be the same in the developing part of the world due to differences in the genetic and environmental elements. Further research studies are needed in the developing countries to establish the prevalence of allergic disorders and the associated predisposing factors. The objective of this study was thus, to evaluate the frequency of allergic disorders and asthma in school-aged children of Karachi and to identify the risk factors as the epidemiology of asthma, allergic rhinitis and other allergic disorders is not well documented in Pakistan.[9]

METHODS

This cross -sectional, questionnaire-based, prospective study was conducted on school children of two randomly selected schools of Karachi from August 2019 to November 2019. Data was collected by using a modified questionnaire based on the ISAAC questionnaire; the structured questions addressed the allergic symptoms, triggering factors of asthma and information regarding allergies in parents. It was developed in two languages i.e. English and Urdu (local language). Written informed consent was obtained from the parents before administering the questionnaire. These were then sent to the parents/caregivers of 360 students of two randomly selected schools of Karachi and we received 341 questionnaires back. Sampling was done through non-probability purposive sampling technique.

INCLUSION CRITERIA

- All school children between 4-15 years of age were included in the study.
- Children whose caregivers consented to be part of the study

EXCLUSION CRITERIA

The following were excluded from the study:

- Children below 4 years of age

- Children with chromosomal abnormalities
- Children with co-morbid conditions e.g. congenital heart disorders
- Children with other respiratory pathology e.g. cystic fibrosis

Data was collected using a structured three- page self-administered questionnaire based on the ISAAC questionnaire with a few modifications. The questionnaire was pre-tested for clarity by piloting on three doctors before distribution. Informed consent was obtained from the parents/caregivers and purpose of the study explained before administering the questionnaire. The school teachers of the two schools were given the questionnaire forms to be distributed to the students to have them filled by their parents/caregivers .Two pediatric residents were assigned the task to collect the filled questionnaire forms from the respective teachers. Each questionnaire took about 15 minutes to fill. Relevant information regarding the triggering factors of asthma as well as frequency of symptoms related to asthma, allergic rhinitis and eczema and any history of parental atopy were recorded on the questionnaire. Ethical Committee clearance was obtained prior to the study. Confidentiality of the respondents and the schools was assured by using a coding system.

STATISTICAL ANALYSIS

Data was entered on MS Excel sheet and compiled. Statistical Package for Social Sciences version 20 was used for data analysis and the results were expressed as frequencies and percentages for qualitative data and mean and standard deviation for quantitative data. Chi-square test was applied for categorical variables. To adjust for the large number of outcome variables, p- value d" 0.05 was considered significant and interpreted as positive in terms of correlation of two cross-tabulated variables.

OPERATIONAL DEFINITIONS

Wheeze: is defined as a whistling sound from the chest and not from the nose or mouth.

Eczema: An inflammatory condition of the skin characterized by redness, itching, and oozing vesicular lesions, which become scaly, crusted, or hardened.

Allergic rhinitis: is a heterogeneous disorder characterized by one or more symptoms including sneezing, itching, nasal congestion, and rhinorrhea.

TABLE1. AGE DISTRIBUTION OF THE STUDY POPULATION (TOTAL N=341)

Age (years)	N	%
< = 5	59	17.3
6 - 10	155	45.5
11 - 15	115	33.7
> 15	12	3.5
Total	341	100

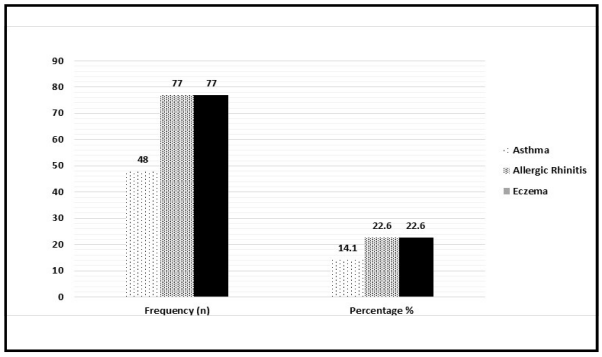


TABLE 2. PREVALENCE OF ALLERGIC DISORDERS IN MALE AND FEMALE

	Gender	
	Male N (%)	Female N (%)
Asthma	25 (17.7%)	23(11.5%)
Allergic rhinitis when no flu in last year	34 (24.1%)	43(21.5%)
Eczema	34(24.1%)	43(21.5%)

TABLE 3. CROSS TABULATION OF PARENTAL ALLERGY WITH WHEEZING IN CHILDREN

Father allergy	Wheezing in Children Yes	P-value No	
History of Asthma in Father	15.8%	11.1%	0.212
Mother allergy			
History of Asthma in Mother	22.9%	9.4%	0.033*
Total	38.7%	20.5%	

Asthma: is defined according to the ISAAC questionnaire as the presence of symptoms of recurrent wheezing or whistling in the last 12 month.[10]

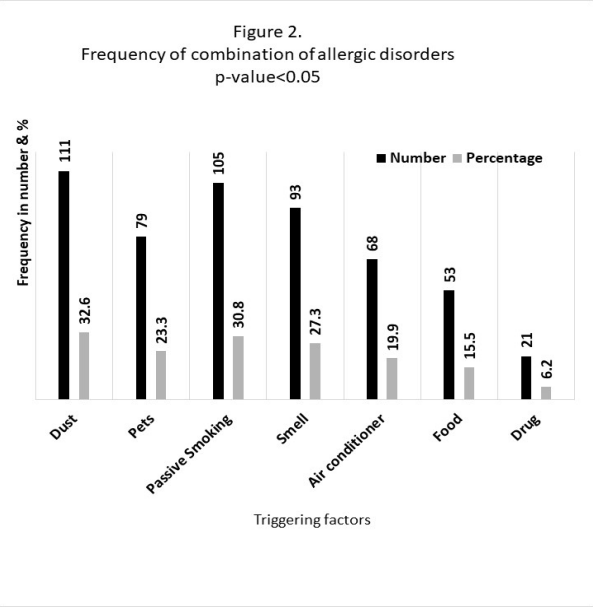
RESULT

Out of a total of 360 questionnaires that were distributed amongst the school children in the age group 4 to 15 years, 341 questionnaires were obtained with a response rate of 95%. The mean age of the study participants was 8 ± SD 1.5 years (Table1.) Out of the total 341 participants, n=141 (41.3%) were male and n=200 (58.7%) were female.

When gender was cross -tabulated with frequency of allergic disorders in the study population, it was observed that males were more prone to develop asthma, allergic rhinitis and eczema as compared to the female gender (Table 2).

The results of our study indicate that children less than 5 years old have a greater predisposition for wheezing .Out of a total of 59 children aged 5 years and less, n= 33 (56%) had a history of wheezing in the past one year and in n=58 (37%)out of a total of n=155 children in the age group 6-10 years history of wheezing was present. Out of a total of 341 children included in the study, n= 116 (34%) had history of wheezing in the 12 months and n=75 (22%) children had a history of nocturnal cough. Out of n=116 children with history of wheezing, in n=17 (15%) of these children wheezing was induced or aggravated by exercise. Figure 1 shows the prevalence of asthma, allergic rhinitis and eczema in the study population.

Figure 1. Frequency of allergic disorders in school children of Karachi



The prevalence of having all the three allergic conditions i.e. asthma, allergic rhinitis and eczema i.e. combination of allergic disorders was only n=6 (1.8%) in the study population where as n=36 (10.6%) were prone to any two of the allergic disorders i.e. asthma or allergic rhinitis or asthma and eczema or allergic rhinitis and eczema.

Our analysis shows strong correlation of history of asthma in the mother with the development of wheezing in the children (p-value less than 0.05)

A number of predisposing factors for these allergic disorders were studied (Figure 2). Exposure to dust, passive smoking, perfume and presence of pets in the house were found to be significantly associated with the development of allergic rhinitis and asthma (p-value <0.05). 10% of the children had allergy to eggs, seafood, cow's milk and wheat. Amongst children who had drug allergy 8% were allergic to penicillin and 1% to ibuprofen.

DISCUSSION

Prevalence rates for asthma show a wide variation globally. High rates as much as 17-30% have been reported in developed countries such as the United Kingdom, New Zealand and Australia whereas Eastern Europe, China and Indonesia show a comparatively low prevalence rate of 1-7%. [10] In our study a prevalence rate of 14.1% was observed for asthma, 22.6 %for both allergic rhinitis and eczema. The burden of allergic disorders and asthma in the pediatric population of Pakistan is showing a rising trend. A study from Karachi by Khan et al [11] reported a frequency of 34.3% for allergic rhinitis, 9.5% for diagnosed cases of asthma and wheezing and 15.2% for eczema. Another local study [9] reported a very high frequency of allergic disorders in school-aged children with allergic rhinitis present in 42.1%, physician diagnosed asthma in 31.58% and eczema in 35.7% of the children. On the contrary, a study from Chennai by Balaji et al observed a prevalence rate of asthma among school children in the 6-17 year age group to be 4.5%, which is much lower than observed in the present study. [12] A similar study from Bangladesh, reported a prevalence rate of 7.3% among children aged 5-14 years. [13] This difference in the prevalence rates for asthma and allergic disorders in different countries can be explained by difference in climatic conditions, level of air pollution, difference in genetic and environmental factors. [10]

In our study wheezing within the past 12 months was observed in 34% of the school children and 15% of them had wheezing induced or aggravated by exercise. In comparison a study from Karnataka, India [14], reported 5% of children to have had a history of wheezing during or after exercise but a comparable number 21.4% had nocturnal cough. However, another study by Kumar SG et al [15] reported a much higher proportion i.e. 37.5 % of the school children to have had asthma symptoms induced or aggravated by exercise.

In the present study asthma, allergic rhinitis and eczema were observed to be more prevalent amongst males as compared to females .A local study conducted on school-aged children observed a significantly higher prevalence of asthma (69.4%) in males as compared to females. [9] This is comparable to the results of a study from Bangladesh [16] wherein asthma was more prevalent (15.6%) in males as compared to females (7.4%). In contrast to our findings another study from Karachi [11] reported both eczema and allergic rhinitis to be more prevalent in females with a much higher prevalence rate of 54.47% and 59.03% respectively.

We observed that the frequency of wheezing was significantly high in children less than 5 years of age followed by the age group 6 to 10 years. These results are similar to a Korean study [17] that reported a decrease in the prevalence of asthma with age. Also, a study from Iran [18] reported a much lower prevalence rate of 1% for physician-diagnosed asthma in the 13-14 year old age group.

In our study, a positive family history for asthma was present in 38.7% of the wheezing children. A study by Rathore et al [19] also reported that a significant number (66%) of children with asthma had a positive family history. It was also observed that a history of maternal asthma was a significant risk factor for those with wheezing. Similar to these results, Majeed et al [8] reported a positive history of maternal allergy to be a significant risk factor for childhood asthma.

The risk for developing asthma is associated with exposure to paternal smoking during childhood. [20] The results of our study confirm this, as it was observed that exposure to dust (indoor/outdoor), domestic pets and presence of a smoker in the house were significantly associated with asthma and allergic rhinitis in children. Studies have observed that house dust mite had a positive association with asthma in children. [21] Similar to our findings Rathore et al. [19] reported that in children who had a history of wheezing in the past 12 months, 76.6% of them had exposure to passive smoking at home .A study by Majeed et al observed that 38.5% of the children with asthma were exposed to cigarette smoke in their homes. Contrary to our findings, Majeed et al [8] also reported that the presence of pets in the house was not a significant risk factor. Hill et al observed that 35% of the children with food allergy developed allergic rhinitis [22]. In our study, food allergy was present in 15.5% of the study population.

There are however a few limitations of this study as it was a cross-sectional study, conducted on school children of a single city; therefore, the findings may

not be generalized due to the different socio-demographic characteristics in different settings. Also, due to feasibility constraints, diagnostic tests could not be done to validate and correlate the parental reports of symptoms of asthma.

CONCLUSION

To sum up, the results of this study indicate a high prevalence of allergic diseases and asthma in school children of Karachi. Apart from a positive family history, perfumes dust exposure, parental smoking and male gender was significantly associated with asthma and other allergic disorders. It is imperative to conduct further research to identify risk factors in relation to the severity of these disorders and to plan and implement preventive strategies.This would help to create public awareness of the risk factors in children, sensitizing people and educating them to seek early treatment.

RECOMMENDATIONS

Further research is needed to elucidate the association between the risk factors and the severity for asthma and allergic disorders.

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REFERENCES

1. Pawankar R, Baena-Cagnani CE, Bousquet J, Canonica GW, Cruz AA, Kaliner MA et al. State of World Allergy Report 2008: Allergy and Chronic Respiratory Diseases. World Allergy Organization Journal. 2008; 1(6): S1-S17

2. Just J, Saint-Pierre P, Gouvis-Echraghi R, Laoudi Y, Roufai L, Momas I et al. Childhood Allergic Asthma Is Not a Single Phenotype. The Journal of Pediatrics. 2014; 164(4): 815-820

3. Bjerg A, Hedman L, Perzanowski MS, Platts –Mills T, Lundbäck B, Rönmark E. Family history of asthma and atopy: in-depth analyses of the impact on asthma and wheeze in 7- to 8-year-old children. Pediatrics.2007; 120(4): 741-748

4. Beasley R, Keil U, von Mutius E, Pearce N. "Worldwide variation in prevalence of symptoms of asthma, allergic rhino conjunctivitis and atopic eczema: ISAAC". Lancet. 1998; 351(9111): 1225-1232

5. Beasley R, Ellwood P, Asher I. International patterns of the prevalence of pediatric asthma: the ISAAC program. Pediatr Clin N Am. 2003; 5(3): 539-553

6. Ostergaard MS, Nantanda R, Tumwine JK, Aabenhus R. Childhood as asthma in low income countries: an invisible killer? Prim Care Respir J.2012; 21:214-19

7. Hasnain SM, Khan M, Saleem A, Waqar MA. Prevalence of asthma and allergic rhinitis among school children of Karachi, Pakistan, 2007. J Asthma .2009; 46(1): 86–90

8. Majeed R, Rajar UD, Shaikh N, Majeed F, Arain AA. Risk factors associated with childhood asthma. J Coll Physicians Surg Pak 2008; 18(5): 299–302

9. Waqar MA, Khan M, Hassnain SM, Saleem A, Shaukat S, Sarwar S et al Prevalence of Allergy and Asthma in School Children of Islamabad, Pakistan. World Appl Sci J.2009; 6(3): 426-432.

10. Asher MI, Montefort S, Bjorksten B, Lai CK, Strachan DP, Weil SK et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhino conjunctivitis, and eczema in childhood: ISAAC phases one and three repeat multicountry cross-sectional surveys. Lancet .2006; 368:733–743

11. Khan AA, Tanzil S, Jamali T, Shahid A, Naeem S, Sahito A. Burden of asthma among children in a developing megacity: childhood asthma study, Pakistan. Journal of Asthma. 2014; 51:891-899

12. Balaji BS, Sha JSI, Elilarasi S. Analysis of the Prevalence of Bronchial Asthma in 6-17 Years Old Urban School Children Belonging to Lower Middle Class and Lower Income Groups. Int J Sci Stud .2017; 5(2): 194-201

13. Hassan MR, Kabir AR, Mahmud AM, Rehman F, Hossain MA, Bennoor KS et al. Self-reported asthma symptoms in children and adults of Bangladesh: findings of the National Asthma Prevalence Study. Int J Epidemiol .2002; 31(2): 483-488

14. Dhakar AS, Kamath R, Pattanshetty S, Mayya SS. Prevalence of childhood asthma among 3-6 years old children, Udipi, Taluk, Karnataka, India.

GJMEDPH. 2015; 4(6): 1-7

15. 23. Kumar GS, Sarkar S, Sahu SK et al. Prevalence and factors associated with asthma among school children in rural Puducherry, India. Current Pediatric Research.2012; 16(2): 159-163

16. Prevalence of Bronchial Asthma Among Secondary School Students in Dhaka City. Sarkar S, Mumu SJ, Shahjahan M, Flora MS, Hafeez MA. Bangl Med J.2012; 41(1): 28-31

17. Kwon JW, Kim BJ, Song Y, Seo JH, Kim TH, Yu J et al. Changes in the prevalence of childhood asthma in Seoul from 1995 to 2008 and its risk factors. Allergy, asthma and immunology research.2011; 3(1): 27-33

18. Zobeiri M. Prevalence, Risk factors and Severity of Asthma Symptoms in Children of Kermanshah, IRAN: ISAAC Phase I, II. Acta Medica Iranica.2011; 49(3); 184-187

19. Rathore AW, Randhawa SM, Ain Q, Maqbool S. Wheezing conditions in early childhood: prevalence and risk factors among pre-school children. Ann King Edward Med Coll. 2005; 11:14-16

20. Weinmayr G, Weiland SK, Bjorksteìn B, and the ISAAC Phase Two Study Group. Atopic sensitization and the international variation of asthma symptom prevalence in children. Am J Respir Crit Care Med.2007; 176:565 -74

21. Mitchell EA, Beasley R, Keil U, Montefort S, Odhiambo J, and the ISAAC Phase Three Study Group. Association between tobacco and the risk of asthma, rhino conjunctivitis and eczema in children and adolescents: analyses from Phase Three of the ISAAC programme. Thorax. 2012; 67: 941–49

22. Hill DA, Grundmeier RW, Ram G, Spergel JM. The epidemiologic characteristics of healthcare provider-diagnosed eczema, asthma, allergic rhinitis and food allergy in children: a retrospective cohort study. BMC Pediatr.2016; 16:133 .DOI 10.1186/s12887-016-0673-z