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Study of Pulmonary Function Tests in School Going Children in Bangalore

[1]R. Geetha Gandhi, [2]K.R. Shalini and [3]V.M. Vivek

[1]*Department of Paediatrics, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bangalore- 560066, India*

[2]*Department of Obstetrics and Gynecology, Rajashree Chatrapathi Shahu Maharaj Government Medical College, Kolhapur, Maharashtra, India*

[3]*Department of Paediatrics, Sapthagiri Institute of Medical Sciences and Research Center, Hesarghatta Road, Bangalore 560090, India*

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Corresponding Author
V.M. Vivek,
Department of Paediatrics, Sapthagiri Institute of Medical Sciences and Research Center, Hesarghatta Road, Bangalore 560090, India
vivekvmv93@gmail.com

Author Designation
[1,2]Ex Junior Resident
[3]Assistant Professor

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ABSTRACT

Pulmonary function tests play an important role in diagnosing airway obstructive disorders such as asthma, defined by a reduction in FEV1/ FVC ratio. Present study was aimed to study of pulmonary function tests in school going children in Bangalore to determine prevalence of airway obstructive disorders such as asthma. The present study was prospective observational study conducted on school going children in urban Bangalore during the period from January 2018 to January 20121. On the basis of the history, students with suspected asthma were subjected to PEFR and spirometry. Among 1000 subjects, based on questioner's 85 (8.5%) of subjects were suspected of asthma. Prevalence of asthma in males was 6.75% and in the female was 10.76%, Among 85 subjects, 31 (36.47%) subjects have wheezing symptoms, 10 (11.76%) subjects have snoring and sleep disturbances, 35 (41.17%) subjects have Itchy rash, 28 (32.94%) subjects have Allergic rhinitis and 4 (32.94%) subjects had obesity. Among 1000 subjects, 85 subjects were suspected asthma, for them Pulmonary function was performed. Five (5.88%) subjects have PEFR <60 followed by 12 (14.11%) subjects have PEFR 60-70, 25 (29.41%) subjects have PEFR 70-80 and 43 (50.58%) subjects have PEFR >80. 1 (1.17%) subjects have FVC <60 followed by 2 (2.35%) subjects have FVC 60-70, 8 (9.41%) subjects have FVC 70-80 and 74 (87.05%) subjects have FVC >80. 2 (2.35%) subjects have FEV1 <60 followed by 2 (2.35%) subjects have FEV1 60-70, 5 (5.88%) subjects have FEV1 70-80 and 76(89.41%) subjects have FEV1 >80. Among 85 asthma suspected subjects, 5 (5.88%) subjects have FEV1/FVC < 80 and 80 (94.11%) subjects have FEV1/FVC $\geq$ 80. Among school going children, FVC, FEV1 and PEFR were found to be statistically significant in the children suspected with asthma based on questionnaire.

INTRODUCTION

Asthma is a major concerning public health problem with wide differences in prevalence and severity throughout the world. There is a significant increase in the prevalence and the severity which have been noticed globally over the past few decades in many geographical regions[1]. However, recent evidence has emerged that the increase in asthma prevalence in the past few decades has been slowed or stabilised[2]. In the past few decades, the rise in asthma prevalence noticed has been too rapid to implicate genetic basis for the changes. However, various environmental factors or lifestyle factors have been implicated and in the last decade, hygiene hypothesis has been put forward as an explanation for the increased prevalence of asthma[1].

The diagnosis of asthma is dependent on the clinical presentation of bronchospasm, fickle airway narrowing, bronchial hyper-responsiveness, airway inflammation and response to inhaled bronchodilators or corticosteroids[3]. Pulmonary function tests play an important role in diagnosing airway obstructive disorders such as asthma, defined by a reduction in FEV1/ FVC ratio. The severity of the obstructive disease is graded based on the reduction of FEV1[3]. Present study was aimed to study of pulmonary function tests in school going children in Bangalore to determine prevalence of airway obstructive disorders such as asthma.

MATERIAL AND METHODS

The present study was conducted on school going children in urban Bangalore, prospective observational study conducted on school going children in urban Bangalore during the period from January 2018 to January 20121. Prior initiation of the study obtained Ethical and Research Committee clearance from Vydehi Institute of Medical Sciences and Research Centre.

Inclusion criteria:

- Age group between 6 to 15 years
- Parents who can participate in questionnaire and give willingness/consent to get PFTs if indicated

Exclusion criteria:

- Children who already have asthma based from questionnaire

During present study, total 8 schools were selected randomly, among 1000 subjects were enrolled into the study according present study inclusion criteria. Subjects for the study were non-randomly selected from schools in Bangalore. After the permission from the principal of the school and an informed consent from the parents/guardians, designed questionnaire was given to obtain the history from parents and students. On the basis of the history, students with suspected asthma were subjected to PEFR and spirometry. Children were instructed not to take any medications or caffeine containing food like chocolate, tea, coffee prior to execution of the test. The procedure was explained prior to it. It was performed using spirometer and the parameters evaluated are:

- FEV1
- Ratio between FEV1/FVC
- FVC

Statistical Analysis Data was entered into Microsoft excel sheets. Descriptive data will be calculated initially (mean, minimum and maximum values, standard deviation). Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. p>0.5 was considered as statistically significant.

RESULTS

During the study period, a total of 1000 subjects were enrolled in the study. The average age of enrolled subjects was 13.51±1.44 (Mean±Sd) the minimum age was 10 years and the maximum age was 15 years. The average weight of enrolled subjects was 43.52±10.57 (Mean±Sd), minimum weight was 24 kgs and maximum age was 90 kgs. The average height of enrolled subjects was 152.15±11.97 (Mean±Sd), minimum height was 140 cms and maximum height was 178 cms. Among 1000 subjects, based on questioner's 85 (8.5%) of subjects were suspected of asthma and 915 (91.50%) were non-asthma. Prevalence of asthma in males was 6.75 % and in the female was 10.76%, difference was statistically significant (p), indicating that females were more risk than males.

In present study, prevalence of asthma in family history of allergy subjects was 12.5 %, prevalence of asthma in a family history of asthma subjects was 6.82%, prevalence of asthma in a exposure to cigarette smoke at home subjects was 32.65%, prevalence of asthma in a exposure to household smoke subjects was 40% and the prevalence of asthma in a pets at home subjects was 18.39%. The p-value was statistically significant for exposure to cigarette smoke at home, exposure to household smoke and pets at home, indicating that those were significant high risk factor to develop asthma.

Among 85 subjects, 31 (36.47%) subjects have wheezing symptoms, 10 (11.76%) subjects have snoring and sleep disturbances, 35 (41.17%) subjects have Itchy rash, 28 (32.94%) subjects have Allergic rhinitis and 4 (32.94%) subjects had obesity. Among 1000 subjects, 85 subjects were suspected asthma, for them Pulmonary function was performed. 5 (5.88%)

Table 1: General characteristics

Demographic	Mean±Sd	Minimum -maximum
Age (Yrs)	13.51±1.44	10-15
Weight (Kgs)	43.52±10.57	24-90
Height (cms)	152.15±11.97	140-178
Class	8.16±1.44	6-10

Table 2: Prevalence of asthma in sex

Sex/Asthma	Yes	No	p-value
Male	38 (6.75%)	525 (93.25%)	0.02
Female	47 (10.76%)	390 (89.24%)	
Total	85 (8.5%)	915 (91.50%)	

Table 3: Family history and exposure

	Yes	No	p-value
Family history of allergy	2 (12.50%)	14 (87.50%)	0.56
Family history of asthma	3 (6.82%)	41 (93.18%)	0.68
Exposure to cigarette smoke at home	16 (32.65%)	33 (67.35%)	0.0001
Exposure to household smoke	12 (40.00%)	18 (60.00%)	0.0001
Pets at home /asthma	16 (18.39%)	71 (81.61%)	0.0005

Table 4: Subjects were distributed based on wheezing sounds

Characteristics	No. of Subjects	Percentage
wheezing sounds sometimes	31	36.47
sleep disturbances and snoring sometimes	10	11.76
Itchy rash sometimes	35	41.17
Allergic rhinitis sometimes	28	32.94
Obesity sometimes	4	4.7

Table 5: Pulmonary function test

Pulmonary function test	No. of Subjects	Percentage
PEFR		
<60	5	5.88
60-70	12	14.11
70-80	25	29.41
>80	43	50.58
FVC		
<60	1	1.17
60-70	2	2.35
70-80	8	9.41
>80	74	87.05
FEV1		
<60	2	2.35
60-70	2	2.35
70-80	5	5.88
>80	76	89.41
FVC/FEV1		
<80	5	5.88
>80	80	94.11

subjects have PEFR <60 followed by 12 (14.11%) subjects have PEFR 60-70, 25 (29.41%) subjects have PEFR 70-80 and 43 (50.58%) subjects have PEFR >80. 1 (1.17%) subjects have FVC <60 followed by 2 (2.35%) subjects have FVC 60-70, 8 (9.41%) subjects have FVC 70-80 and 74 (87.05%) subjects have FVC >80. 2 (2.35%) subjects have FEV1 <60 followed by 2 (2.35%) subjects have FEV1 60-70, 5 (5.88%) subjects have FEV1 70-80 and 76(89.41%) subjects have FEV1 >80. Among 85 asthma suspected subjects, 5 (5.88%) subjects have FEV1/FVC < 80 and 80 (94.11%) subjects have FEV1/FVC $\geq$80.

DISCUSSIONS

Asthma is one of the most significant chronic diseases of childhood, causing substantial morbidity. An increase in the rates of hospital admission and primary care contacts for asthma in childhood has led to concern regarding the prevalence or severity of increasing wheezing illness in children. Asthma includes a range of heterogeneous phenotypes that vary in presentation, etiology and pathophysiology. The risk factors for each recognized phenotype of asthma include genetic, environmental and host factors which had played an important role in early childhood.

In recent years, a preponderance of the researchers is either using a questionnaire suggested by the 50-nation International Study of Bronchial Asthma and Allergy in Children (ISSAC) or the definition of bronchial asthma as modified by the United Kingdom Medical Research Council (MRC)[4]. The predictable global prevalence of asthma is 200 million with a mortality of around 0.2 million per year. Even though the prevalence in developed countries is more, due to the differences in population in the developing countries have a higher total burden of the disease. The estimated burden of asthma in India is thought to be more than 15 million[5].

In the present study, the overall prevalence of bronchial asthma among children of the school-going age group was found to be 8.5%. The conclusions of the study were consistent with Singh *et al.*[6] and Jain *et al.*[7] who reported a prevalence of 11.9%, 11.2%, 11.9-10.3% respectively. However, Chhabra *et al.*[8] reported a much higher prevalence rate of 11.9% amongst Delhi school children. A similar higher prevalence rate was reported by Parmesh[9] who showed a prevalence of 29.5% in Bangalore city. This high prevalence rate may be explained by different levels of air pollution, exposure to allergens and climatic conditions. Global warming has also got an important role to play in the upsurge of allergic disorders worldwide over the last three decades. Increase temperature and carbon dioxide (CO2) production due to climatic change will result in increased production of pollens and fungal spores that could exacerbate symptoms of allergic disease. There is also some evidence of significantly stronger allergenicity in pollen at increased temperatures[10].

In present study, among the suspected individuals for asthma, pulmonary function test showed a reduction in FEV1/FVC in 5 subjects inferring a obstructive disease. Out of which 2 subjects had FEV1 <60 (2.35%) indicating moderate to severe obstruction, 2 subjects had FEV1 was 60-70 (2.35%) indicating mild obstruction and 81 subjects had >70 (95.29%). FVC, FEV1 and PEFR were found to be statistically significant in the study groups.

In study by Tahera *et al.*[11] for FVC and FEV1, highest correlation was found with age in girls and height in boys. For FEV1%, significant negative correlation was found with age and height in both sexes, but positive correlation was found with surface area. Similarly, PEFR showed highest correlation with surface area in boys and girls. Limitation of present study were, as the questionnaire involved past questions it can be affected by recall bias.

Bronchodilators and Bronchial Challenge Tests were not performed in this study. As Asthma is a periodic flare event, a normal PFT during symptom free period does not rule out asthma. A large number of school children to be assessed for a conclusive strategy.

CONCLUSION

In the present study, the overall prevalence of bronchial asthma among children of the school-going age group was found to be 8.5%. Pulmonary Function Tests are used to measure baseline status of respiratory function, to monitor treatment and to estimate prognosis. In present study, among school going children, FVC, FEV1 and PEFR were found to be statistically significant in the children suspected with asthma based on questionnaire.

REFERENCES

1. Rook, G.A.W., 2007. The hygiene hypothesis and the increasing prevalence of chronic inflammatory disorders. Trans. Royal. Soc. Trop. Med. Hyg., 101: 1072-1074.
2. Lawson, J.A. and A. Senthilselvan, 2005. Asthma epidemiology: Has the crisis passed. Curr. Opin. Pulm. Med., 11: 79-84.
3. Soriano, J.B., A.A. Abajobir, K.H. Abate, S.F. Abera and A. Agrawal, 2017. Global, regional, and national deaths, prevalence, disability-adjusted life years, and years lived with disability for chronic obstructive pulmonary disease and asthma, 1990-2015: A systematic analysis for the global burden of disease study 2015. Lancet. Respir. Med., 5: 691-706.
4. Lai, C.,K.W. and R Beasley, 2009. Global variation in the prevalence and severity of asthma symptoms: phase three of the international study of asthma and allergies in childhood (ISAAC). Thorax., 64: 476-483.
5. Aggarwal, A.,N.S. and K. Chaudhry, 2006. Prevalence and risk factors for bronchial asthma in Indian adults: a multicentre study. Indian. J. Chest. Dis. Allied. Sci., 48: 13-22.
6. Singh, M.,S. and P. Singh, 2004. Prevalence of Bronchial Asthma among school children in urban and rural areas. Chest., Vol. 126.
7. Jain, A., H.V. Bhat and D. Acharya, 2010. Prevalence of bronchial asthma in rural Indian children: A cross sectional study from South India. Indian. J. Pediatr., 77: 31-35.
8. Chhabra, S.K., C.K. Gupta, P. Chhabra and S.R. Pal, 1998. Prevalence of bronchial asthma in schoolchildren in delhi. J. Asthma., 35: 291-296.
9. Paramesh, H., 2002. Epidemiology of asthma in India. Indian. J. Pediatr., 69: 309-312.
10. Beggs, P.J., 2004. Impacts of climate change on aeroallergens: Past and future. Clin. Exp. Allergy., 34: 1507-1513.
11. Chudasama, R., T. Doctor and S. Trivedi, 2010. Pulmonary function test in healthy school children of 8 to 14 years age in south gujarat region, India. Lung. India., 27: 145-148.