

# “PREVALENCE OF EXERCISE INDUCED ASTHMA IN SCHOOL GOING CHILDREN OF AHMEDNAGAR AREA - AN OBSERVATIONAL STUDY”

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*Aanchal R. Sarawgi*

### **ABSTRACT**

**TITLE OF THE STUDY:** Prevalence of Exercise Induced Asthma In School Going Children Of Ahmednagar Area - An Observational Study.

**INVESTIGATOR:** Miss .Aanchal R Sarawgi

**GUIDE:** Dr. Arijit Kumar Das (P.T.), Associate Professor, Cardio- Vascular Respiratory Sciences, D.V.V.P.F's College of Physiotherapy.

### **BACKGROUND:**

Asthma is a chronic inflammatory respiratory tract disease that affects individuals of all ages which could be severe and even fatal. Currently, more than 300 million people are suffering from asthma globally and its prevalence among children is on the increase. Exercise-induced asthma (EIA) is defined as an acute, transient airway narrowing occurring during, and most often, after strenuous exercise. The diagnosis of EIA is suggested by the clinical history and demonstrated by a decrease of 15% in forced expiratory volume in one second (FEV1) or peak expiratory flow rate (PEF) after an exercise challenge in accordance with European Respiratory Society (ERS) and American Thoracic Society (ATS) statements. Exercise is not only a very common precipitant of acute asthmatic episodes but also a potent non-pharmacological test for diagnosis of asthma. The 6-min run test (SMRT), also known as 6-min walking run test, 6-min jog-walk test Mini-Cooper or Reduced Cooper test is a cardiorespiratory fitness field based test whose potential administration in adult populations deserves to be analyzed. This is due to the incontrovertible benefits that the test presents: ease of administration, short duration and self-regulation of the pace of execution. Therefore, it is considered one of the most powerful markers

of health, even above other traditional indicators such as weight status, blood pressure or cholesterol level.<sup>5</sup> Hence After this study it will be determined how many student suffer from exercise induced asthma, hence proper precautions and training can be given to the students.

**AIM:** To determine how many school students, suffer from exercise induced asthma in Ahmednagar area

**OBJECTIVES:**

- To determine how many school students from age 8-14 yrs old, suffer from exercise induced asthma in Ahmednagar area.
- To record pre and post peak flow meter rate in school going children for 6 min run test.
- Provide awareness about exercise induced asthma in students.

**METHODS:** 100 school children were chosen according to inclusive and exclusive criteria, PEFr was measured PRE-6MRT and POST-6MRT and difference between was calculated. More than 15% fall in POST-6MRT when compared to PRE-6MRT, indicated “Exercise- Induced Asthma”.

**PROCEDURE:**

- Ethical committee clearance was obtained.
- Consent will be obtained from students’ parents/ guardians.
- Vital will be checked before beginning with the procedure of the test
- Pre peak flow meter rate will be obtained.
- Student will be instructed and prepared for the test.
- 6MRT will be performed.
- Post Peak flow meter rate will be obtained.
- Difference percentage will be calculated.

**DATA ANALYSIS:** Percentage of difference was calculated of PRE-6MRT and POST-6MRT.

**RESULT:** Decrease in Post- run PEFr-27%, out of that more than 15% decrease was seen in 21% of the children. Increase in Post- run PEFr was 58% whereas 15% of the children showed no change.

## **CONCLUSION:**

Compared to other studies there is decrease in prevalence of exercised induced asthma in this study, the reason might be because of clean and dust free environment where the weather conditions were taken care of, the timing of the test was such that it was in mid-morning when the condition was neither too hot nor too cold. Whereas there was 58% increase of Post- run PEFR, that may be effort-dependent because greater effort during early expiration causes flow limitation at a higher lung volume, where elastic lung recoil is greater and airway resistance is lower which permits a higher PEF.

**KEYWORDS:** Exercise Induced Asthma, Peak expiratory flow rate, Peak Flow meter, Six minute run test, School going children.

# **INTRODUCTION**

The term “Asthma” comes from the Greek verb *aazein*, meaning to pant, to exhale with the mouth open or sharp breath. Asthma may be defined as a chronic inflammatory disease of the airways associated with widespread but variable outflow obstruction of the airways, manifesting clinically with wheezing, recurrent cough, difficulty with breathing, and chest tightness.<sup>1</sup>

Asthma is a chronic inflammatory respiratory tract disease that affects individuals of all ages which could be severe and even fatal. Currently, more than 300 million people are suffering from asthma globally and its prevalence among children is on the increase. The prevalence of asthma has also been reported to be on the increase over the past few decades with the highest increase among children and adolescents living in the inner cities and regions where low prevalence had previously been reported. The prevalence of asthma is on the increase in both developed and developing countries over the last three decades. For instance, the phase one report of the International Study of Asthma and Allergies in Children reported that the prevalence of asthma symptoms ranged from less than 5% in developing countries to more than 20% in developed countries. This increase has mainly been attributed to the increasing urbanization in developing countries including Africa. Nonetheless, the burden of respiratory disease still remains largely unknown in Africa.<sup>2</sup>

Exercise-induced asthma (EIA) is defined as an acute, transient airway narrowing occurring during, and most often, after strenuous exercise. The diagnosis of EIA is suggested by the clinical history and demonstrated by a decrease of 15% in forced expiratory volume in one second (FEV1) or peak expiratory flow rate (PEF) after an exercise challenge in accordance with

European Respiratory Society (ERS) and American Thoracic Society (ATS) statements. Exercise is not only a very common precipitant of acute asthmatic episodes but also a potent non-pharmacological test for diagnosis of asthma. Different exercise protocols have been used; however a simple exercise test would be valuable and helpful for detecting exercise-induced asthma (EIA).<sup>3</sup>

Prevalence rates may be twice as high in poor and minority populations.<sup>3</sup> Prior to puberty, asthma is more common and more severe in boys; after puberty, asthma is more common and more severe in women.<sup>2,4</sup> Although genetic predisposition plays an important role in the development of allergy and asthma,<sup>5</sup> the etiology of asthma is complex. It most likely is determined by multiple interacting genetic and environmental factors. Well-established risk factors for asthma include male sex, race, allergic rhinitis, atopic dermatitis, family history of atopy, viral lower respiratory tract infections early in life, and exposure to indoor and outdoor air pollution.<sup>4</sup>

The 6-min run test (SMRT), also known as 6-min walking run test, 6-min jog-walk test Mini-Cooper or Reduced Cooper test is a cardiorespiratory fitness field based test whose potential administration in adult populations deserves to be analyzed. This is due to the incontrovertible benefits that the test presents: ease of administration, short duration and self-regulation of the pace of execution. Consequently, this test has commonly been utilized to measure cardiorespiratory fitness levels in populations for which motivation is a limiting factor as regards assessment of top performance.<sup>5</sup>

Physical fitness constitutes an integrated measure of all the functions and structures involved in the performance of physical activity. Particularly cardiorespiratory fitness reflects the overall capacity of the cardiovascular and respiratory systems to supply oxygen during sustained physical activity. Currently there is strong evidence that cardiorespiratory fitness constitutes an important predictor of morbidity and mortality.<sup>6</sup>

Therefore, it is considered one of the most powerful markers of health, even above other traditional indicators such as weight status, blood pressure or cholesterol level.<sup>5</sup> Hence After this study it will be determined how many student suffer from exercise induced asthma, hence proper precautions and training can be given to the students.

## ***NEED FOR STUDY***

After this study it will be determined how many students suffer from exercise induced asthma, hence proper precautions and training can be given to the students.

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## ***AIMS AND OJECTIVES***

- To determine how many school students, suffer from exercise induced asthma in Ahmednagar area.
- To determine how many school students from age 8-14 yrs old, suffer from exercise induced asthma in Ahmednagar area.
- To record pre and post peak flow meter rate in school going children for 6 min run test.
- Provide awareness about exercise induced asthma in students.

## ***REVIEW OF LITERATURE***

- 1. Akhiwu H** *Asthma triggers in primary school pupils aged 6–11 years in a Nigerian population* was descriptive cross-sectional, with a study population of 836-registered Nigerian primary school pupils from 39 randomly selected schools in Kano metropolis. Information was obtained from the pupils and their parents/caregivers using questionnaires. The data obtained were analyzed using Statistical Package for Social Science (SPSS) version 16 developed by IBM cooperation. Qualitative data (sex, social class, and suspected trigger factors) were represented as percentages, Chi-square ( $\chi^2$ ) test was used to determine associations between the categorical variables and a  $P \leq 0.05$  was presumed statistically significant. Results: Asthma was diagnosed in 101 pupils. It was observed that common cold, household dust exposure, physical exercise as well as exposure to wood smoke and insecticides were the most common trigger factors but patients can have more than one trigger factor for their acute exacerbations. Conclusion: Against the background of the common disease provocateurs, it is suggested that the relevant control strategies along with the required avoidance recommendations of the common risk agents be pursued by the appropriate health policy-making bodies and managing physicians, respectively.
- 2. Adewumi A** Association *between exercise-induced asthma and parental socio-economic status among school-aged adolescents in a semi urban community in Nigeria* was study done on three hundred and eighty-five adolescents (185 male and 200 female adolescents) whose ages ranged between 10 and 19 years participated in this cross-sectional study. Participants were recruited from four government approved secondary schools in Ido-Ekiti using a multistage sampling technique. Peak expiratory flow rate (PEFR) was assessed at baseline and after 6-min run test (6-MRT) on a level playing ground using a standard peak flow meter. PEFR measurements were repeated at 5th, 10th, 15th, and 20th min post 6-MRT. Participants who had >15.0% PEFR fall were considered to have EIA. PSES was assessed using a validated socio-economic status questionnaire. More than half of the participants, 58.2% had EIA (>15.0% PEFR scores)



while 53.5% belonged to middle PSES class. There was no significant difference between PEFR scores of male and female participants at baseline and 5th min post 6-MRT. However, male participants had significant higher PEFR than the female counterparts at 10th ( $t=2.090$ ,  $P=0.037$ ), 15th ( $t=2.162$ ,  $P=0.031$ ), and 20th min ( $t=2.978$ ,  $P=0.003$ ). There was significant association between EIA and PSES ( $\chi^2=152.4$ ;  $P=0.001$ ).

3. **Perez C Reliability and convergent validity of the 6-min run test in young adults with Down syndrome** was a cross-sectional design fifty-one young adults with DS (mean age 26.20  $\pm$  7.14 years; 54% women) performed the 6-min run test and the 16-min shuttle run test twice with a one week-interval between test and retest. Results: The 6-min run test offered high reliability for the distances covered (ICC: 0.974; 95% CI: 0.955e0.985) and good reliability when comparing peak heart rate values obtained in the test and retest. A significant correlation between the 6-min run test and the 16-min shuttle run test was observed for the test ( $r = 0.705$ ; Sig = 0.001), and retest phases ( $r = 0.651$ ; Sig = 0.001). The relationship between the estimated maximal oxygen consumption (VO<sub>2</sub> max) peak after the performance of the 16-min shuttle run test and the distance covered by the 6-min run test was statistically significant ( $r = 0.7$ ). No significant differences were found between the equations that estimate VO<sub>2</sub> peak for both tests. Conclusions: These findings suggest that the 6-min run test shows high test/retest reliability and moderate to moderately high convergent validity when performed by adults with DS.
4. **Ross K Assessing the relationship between obesity and asthma in adolescent patients: a review** was study done on the parallel rise in the prevalence of obesity and asthma over the last several decades has led to an extensive line of investigation into the relationship between these two conditions. This review will discuss evidence from laboratory-based studies, observational clinical studies, and clinical trials that suggests that obesity adversely influences asthma through multiple mechanisms. The effect of obesity on asthma during adolescence, including asthma incidence, the severity and control of existing asthma, lung function, and exacerbations, will be reviewed.
5. **O F Awopeju Exercise-induced asthma in adult Nigerian asthma patients: a comparison of step test, free running, and bicycle ergometer** Forty-eight asthma patients who performed and completed the exercise tests reaching at least 80–85% of the predicted maximal heart rate. The peak expiratory flow (PEF) values and heart rate (HR) were used to monitor pulmonary function post-exercise and the intensity of the exercise respectively. The PEF values were measured at baseline, immediately after the exercise then at 5-minute intervals up to 30 minutes. Subjects who reached the percentage fall in PEF  $\geq 15\%$  were considered positive for EIA. Free running was found to be the most asthmagenic exercise followed by the step test and cycle ergometer: 36 subjects (75%) for free running versus 27 subjects (56%) for step test, versus 24 subjects (50%) for cycle ergometer. There is a strong and significant correlation between the percentage fall in PEF of cycle ergometer and step test ( $r=0.61$ ,  $p<0.001$ ). Free running produced the most positive result.

6. ***Vega D Criterion-Related Validity of the Distance and Time-Based Walk/Run Field Tests for Estimating Cardiorespiratory Fitness: A Systematic Review and Meta-Analysis*** The main purpose of the present meta-analysis was to examine the criterion-related validity of the distance- and time-based walk/run tests for estimating cardiorespiratory fitness among apparently healthy children and adults. From the 123 included studies, a total of 200 correlation values were analyzed. The overall results showed that the criterion-related validity of the walk/run tests for estimating maximum oxygen uptake ranged from low to moderate ( $r_p = 0.42\text{--}0.79$ ), with the 1.5 mile ( $r_p = 0.79, 0.73\text{--}0.85$ ) and 12 min walk/run tests ( $r_p = 0.78, 0.72\text{--}0.83$ ) having the higher criterion-related validity for distance- and time-based field tests, respectively. The present meta-analysis also showed that sex, age and maximum oxygen uptake level do not seem to affect the criterion-related validity of the walk/run tests. Conclusions when the evaluation of an individual's maximum oxygen uptake attained during a laboratory test is not feasible, the 1.5 mile and 12 min walk/run tests represent useful alternatives for estimating cardiorespiratory fitness.

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## ***METHODOLOGY***

## **Materials and Methodology –**

***STUDY DESIGN-*** Cross sectional study

***STUDY SETTING-*** Affiliated School in Ahmednagar, Central and State board.

***SAMPLING METHOD-*** Convenient Sampling

***STUDY DURATION -*** 6 months- (September 2017 to February 2018)

***STUDY SAMPLE-*** 100 students.

### ***MATERIALS USED-***

- a. Cones
- b. A stopwatch
- c. Measuring tape
- d. Chair
- e. Peak flow meter
- f. Portable pulse oximeter
- g. Rotahaler

### ***SELECTION CRITERIA-***

#### **Inclusion Criteria:**

- ❖ Subject should be of age between 8yrs old to 14yrs old.
- ❖ Subject must be physically active.
- ❖ Should be able to walk independently for minimum 10 mins.
- ❖ Should be cognitively sound to understand the given instructions.
- ❖ Should be vitally stable (BP, SPO<sub>2</sub>, HR).

#### **Exclusion Criteria:**

- ❖ Subjects with visual ailments.
- ❖ Subjects with diagnosed cardio vascular or respiratory disease.
- ❖ Subjects with diagnosed fractures or neurological problems which may interfere the walking ability.
- ❖ Uncooperative or unwilling students.

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## ***PROCEDURE***

- Ethical committee clearance was obtained.
- Consent will be obtained from students' parents/ guardians.
- Vital will be checked before beginning with the procedure of the test
- Pre peak flow meter rate will be obtained.
- Student will be instructed and prepared for the test.
- 6MRT will be performed.
- Post Peak flow meter rate will be obtained.
- Difference percentage will be calculated.

A **6-min run test (6-MRT)** was performed on a level playing ground of 50 m long during school break period (10:30 a.m. and 11.00 a.m.). Participants were encouraged in the standard manner by telling them to run at their own selected pace until the end of six minutes. Five min after 6-MRT, the PEFr was reassessed using the peak flow meter. Measurements of PEFr was also reassessed at 5-min intervals post 6-MRT over a period of 20 min

A stopwatch was used to record the duration of 6-MRT

Presence of EIA was determined following a >15.0% fall in the PEFr post exercise using the formula described by

$$\text{Computation: } \frac{(\text{pre exercise value} - \text{lowest of post exercise value}) \times 100}{\text{Pre exercise value}}$$

#### **Patient preparation:**

- Comfortable clothing should be worn.
- Appropriate shoes for walking should be worn.
- A light meal is acceptable before early morning or early afternoon tests.
- Patient's should not have exercised vigorously within 2 hours.
- The patient should sit at rest in a chair, located near the starting position, for at least 10 minutes before the test starts.
- Baseline heart rate and Peak Flow Expiratory Rate should be calculated.

**Instructions:**

- The subject has to walk/run a distance of 30 meters.
- He must be instructed to walk/run as fast as possible.
- He has to walk/run back and forth around the cones.
- If the subject at any point feels breathless, immediately he must be given a chair to sit. But during this time the timer will not stop and the time will continue.
- Subject must be encouraged to walk/run and complete the test by telling them about the remaining time and how well are they doing it.
- After the completion the test, a chair must be given to the patient to rest and immediately peak flow meter rate will be taken.
- Then after one minute count manually the pulse rate and calculate the difference between the pre and post peak flow meter rate.
- This will determine how many students have 15% decrease in peak flow rate post 6 min run compared to pre run values.

**Statistical Analysis:** The data obtained will be analysed using the descriptive statistics.

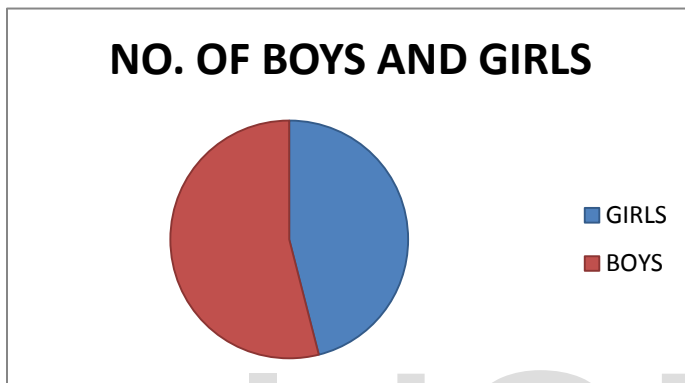
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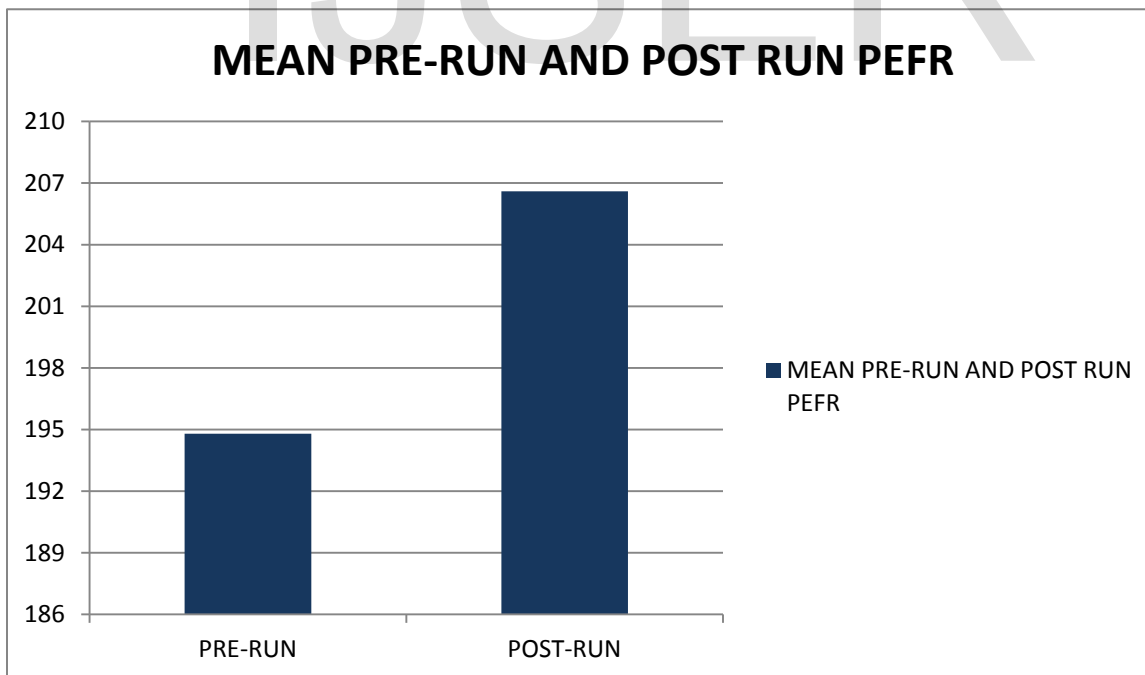
## RESULT

Table 1: BASELINE

SR.NO	VARIABLES	TOTAL
1.	No. of Boys	54
2.	No. of Girls	46
3.	Mean of Pre- Run PEFR	194.8
4.	Mean of Post- Run PEFR	206.6



*Graph 1: Comparison between number of girls and boys.*

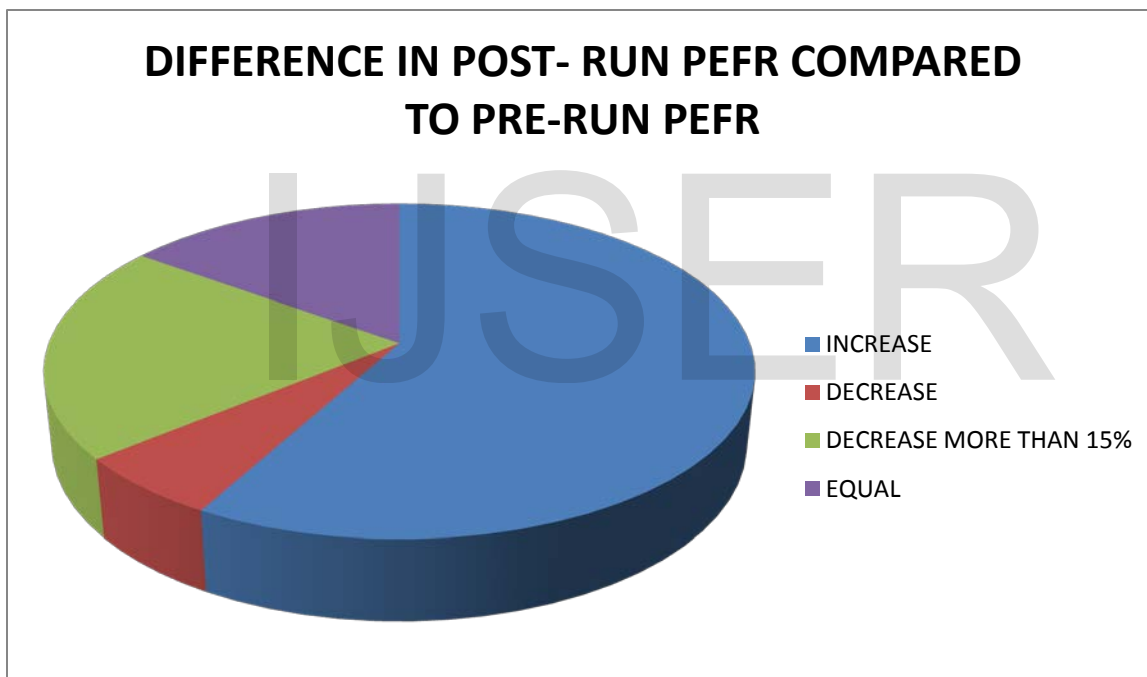


*Graph 2: Difference between mean Pre- run PEFR and Post- run PEFR.*



**Table 2: Percentage of difference calculated in 100 children - PRE-RUN PEFR and POST RUN PEFR:**

<i>Sr.no</i>	<i>Variables</i>	<i>Percentage of children</i>
<b>1.</b>	Decrease in Post- run PEFR	<b>27%</b>
	Out of that more than 15% decrease	<b>21%</b>
<b>2.</b>	Increase in Post- run PEFR	<b>58%</b>
<b>3.</b>	No difference	<b>15%</b>



**Graph 3: Difference between Post- Run PEFR compared to Pre- Run PEFR.**

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## ***DISCUSSION***

The prevalence of asthma has also been reported to be on the increase over the past few decades with the highest increase among children and adolescents living in the inner cities and regions where low prevalence had previously been reported. The prevalence of asthma is on the increase in both developed and developing countries over the last three decades.

The plausible explanation for the high prevalence of EIA may be attributed to poor neighborhood environment where the studies were conducted though it is believed that living in areas with high standards of sanitation with clean houses and environment, frequent access to antibiotics, vaccination and reduced exposure to viral, bacteria and helminthic infections may increase the risk of allergic diseases including asthma (Lynch et al., 1997; Weinberg, 2000).

The 6-min run test (SMRT), also known as 6-min walking run test, 6-min jog-walk test Mini-Cooper or Reduced Cooper test is a cardiorespiratory fitness field based test whose potential administration in adult populations deserves to be analyzed. This is due to the incontrovertible benefits that the test presents: ease of administration, short duration and self-regulation of the pace of execution. Consequently, this test has commonly been utilized to measure cardiorespiratory fitness levels in populations for which motivation is a limiting factor as regards assessment of top performance.<sup>5</sup> Study by Carlos Ayan-Perez 2017 concluded that The results of the study indicate that SMRT shows high test/retest reliability and moderate to moderately high convergent validity when performed by adults with DS.

100 Students were taken as participants, with almost equal amount of boys and girls. According to the result calculated there were 21% of students who were diagnosed with "Exercise Induced Asthma", as per study conducted by "Adekola A. Adewumi, Rufus A. Adedoyin et al - Association between exercise-induced asthma and parental socio-economic status among school-aged adolescents in a semi urban community in Nigeria". Compared to other studies there is decrease in prevalence of exercised induced asthma in this study, the reason might be because of clean and dust free environment where the weather conditions were taken care of, the timing of the test was such that it was in mid-morning when the condition was neither too hot nor too cold.

There was increase in Post- Run PEF in 58%, which as stated by "P.H. Quanjer, M.D. Lebowitz in Peak expiratory flow: conclusions and recommendations of a Working Party of the European Respiratory Society-1997" that In some cases, the PEF is effort-dependent because greater effort during early expiration causes flow limitation at a higher lung volume, where elastic lung recoil is greater and airways resistance lower, permitting a higher PEF.

Hence, it is concluded that due to clean and proper environmental conditions there was only 15% of children that showed prevalence of asthma induced by exercises whereas increase of post- run PEF compared to pre-run PEF in about 58% of children was because of effort-dependent PEF.

In future studies, categorization of participants according to gender and age should be considered.

# ***CONCLUSION***

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It was concluded that, compared to other studies there is decrease in prevalence of exercised induced asthma in this study, the reason might be because of clean and dust free environment where the weather conditions were taken care of, the timing of the test was such that it was in mid-morning when the condition was neither too hot nor too cold.

Whereas there was 58% increase of Post- run PEF, that may be effort-dependent because greater effort during early expiration causes flow limitation at a higher lung volume, where elastic lung recoil is greater and airway resistance is lower which permits a higher PEF.

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# ***LIMITATIONS***

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- Participants were not segregated according gender and age.
- Sample size is small.

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## ***REFERENCE***

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1. **Akhiwu H O, Mustafa A, Johnson A, Ibrahim M** - *Asthma Triggers In Primary School Pupils Aged 6–11 Years In A Nigerian Population* –September 18, 2017, IP: 49.14.240.197.
2. **Adekola A. Adewumi, Rufus A. Adedoyin et al.** - *Association Between Exercise-Induced Asthma And Parental Socio-Economic Status Among School-Aged Adolescents In A Semi Urban Community In Nigeria-* Journal of Exercise Rehabilitation 2017;13(3):292-299.
3. **Perez C, Lemos I, Carral** - *Reliability And Convergent Validity Of The 6-Min Run Test In Young Adults With Down Syndrome-* J Disability and Health Journal 10 (2017) 105e113.
4. **Ross K, Hart M** - *Assessing The Relationship Between Obesity And Asthma In Adolescent Patients: A Review-* Adolescent Health, Medicine and Therapeutics 2013;4 39–49.
5. **O F Awopeju, G E Erhabor, M O Balogun, D O Obaseki, F A Erhabor et al-** *Exercise-Induced Asthma In Adult Nigerian Asthma Patients: A Comparison Of Step Test, Free Running, And Bicycle Ergometer* - African Journal of Respiratory Medicine Vol 7 No 1 September 2011.
6. **Vega D, Parrilla R, Ornelas M, Viciano J-** *Criterion-Related Validity of the Distance and Time-Based Walk/Run Field Tests for Estimating Cardiorespiratory Fitness: A Systematic Review and Meta-Analysis-* PLOS ONE | DOI:10.1371/journal.pone.0151671 March 17, 2016.
7. **Carlos Ayan Perez, R. Ivan Martinez Lemos, Jose M. Cancela Carral-** *Reliability and convergent validity of the 6-min run test in young adults with Down syndrome* Disability and Health Journal 10 (2017) 105-113.