

# Prevalence of Exercise-Induced Broncho-Constriction in Medical Students.

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## ABSTRACT

**Background:** Exercise-Induced Bronchoconstriction (EIB) is a transient acute narrowing of the airway which occurs as a result of exercise. EIB is common in children. The prevalence of EIB has been estimated to be 20% in general individuals without a known diagnosis of asthma. Eighty percent of all asthma individuals experience exercise-related symptoms (ERS). The purpose of this study was to investigate the prevalence of EIB in medical students using an exercise challenge test. **Aims And Objectives –** To study the prevalence of prevalence of EIB in medical student and to investigate the relationship between EIB and the history of asthma, history of ERS, allergy including rhinitis, atopic dermatitis, hay fever, allergies to food and animals. **Methods:** This study was done on medical student of NMCH, Jamuhar between January 2019 and March 2019. Medical students underwent exercise challenge test on bicycle -ergometry. Spirometry was performed a few minutes before and immediately after performance of the exercise. The criterion for a positive test was a greater than 10% decrease in FEV1 from the baseline measurement. **Results:** Total 188 students completed the study, out of which 24 came to be EIB positive. 17 had history of asthma of which 15 came to be EIB positive. 13 had history of ERS of which 11 came to be EIB positive. **Conclusion:** In our study prevalence of EIB came to be 12.7%. EIB in student having history of asthma came to be 88.2%. EIB in student having history of ERS came to be 84.6%.

**Keywords:** EIB, PFT, ERS, FEV1.

**Abbreviation-** EIB- Exercise-induced bronchoconstriction, PFT-pulmonary function test, ERS-exercise-related symptoms, FEV1- Forced expiratory volume in one second.

## INTRODUCTION

Exercise-induced bronchoconstriction (EIB) is a transient acute narrowing of the airways which occurs as a result of exercise. The occurrence of bronchoconstriction, especially with symptoms during or after exercise, is common characteristics of asthma, but it may also occur in the absence of other clinical features of bronchial asthma. In bronchial asthmatic patients EIB in itself is a marker of poor control and leads to the need to start or step up therapy.<sup>[1]</sup>

The EIB prevalence varies, depending on a lot of factors, including whether bronchial asthma is present, the severity and control of asthma if it present, environmental factors, type of testing, and demographics factors.<sup>[2]</sup> EIB is a common in children.<sup>3</sup>The prevalence of EIB has been estimated to be 20% in general individuals without a known

diagnosis of asthma.<sup>[4]</sup> Eighty percent of all individuals with bronchial asthma have exercise-related symptoms (ERS).<sup>[5,6]</sup>

Symptoms of EIB include wheeze, chest tightness and shortness of breath (dyspnea), and cough. they may also include chest pain (primarily in children), excessive mucus secretion, or feeling out of comfort when the patient is actually in healthy physical condition.<sup>[7,8]</sup> Because these symptoms may also occur with other conditions, a diagnosis of EIB based only on symptoms lacks any reasonable diagnostic sensitivity and specificity. Symptoms only cannot predict a positive exercise challenge result in adults or children.<sup>[9]</sup>

Thus the diagnosis of EIB could never be made depending on symptoms only if unaccompanied by data from an objective exercise test or surrogate challenge test.<sup>[10-13]</sup> A 10% or greater decrease in FEV1 from the pre-exercise value at any two consecutive times points within 30 minutes of stopping exercise testing may be considered diagnostic of EIB.<sup>[12-14]</sup>

The purpose of this study was to investigate the prevalence of EIB in medical student using an exercise challenge test. We also investigated the

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relationship between EIB and the history of asthma, history of ERS.

### Aims And Objectives

1. To study the prevalence of prevalence of EIB in medical students
2. To investigate the relationship between EIB and the history of asthma, history of ERS.

## MATERIALS AND METHODS

### Study duration

January 2019 to March 2019.

### Inclusion criteria

1. Medical students of NMCH Jamuhar.

### Exclusion criteria

1. FEV1 less than 70% of predicted value.
2. Recent upper-respiratory tract infection within the two previous weeks.
3. Inability to perform the exercise challenge test.
4. History of severe cardiovascular and pulmonary disease.

### Pregnancy Study design and protocol

This study was approved by the ethics committee of our institute. All participation was voluntary. Written informed consent was obtained from all participants after an explanation of the study purpose and the potential risks of the study protocol. All participants completed a questionnaire to assess any history of asthma, any respiratory symptoms during and/or after exercise, any allergies and the type of sports played. All students subjected to sputum-smear microscopy for acid-fast bacillus (AFB) and chest radiography at the time of enrolment for the study. A detailed clinical history and previous treatment history for anti-tuberculosis therapy was taken from every Patient. PFT was done in every patient.

The exercise was done on bicycle - ergometry. At start of exercise it was brisk (increasing severity of exercise) within first 2 to 3 minutes to reach a heart rate of 85% of maximum. After that they continued to exercise for 6 minutes maintain that heart rate and after that recovery phase will be started (EIB Updates 2016). During the exercise challenge test, we measured the participant's heart rate, blood pressure and electrocardiogram. The criterion for a positive test was a greater than 10% decrease in FEV1 from the baseline measurement. A post-exercise decrease in FEV1 was calculated using the formula  $\{(baseline\ FEV1 - post-exercise\ challenge\ FEV1) / baseline\ FEV1\} \times 100$ .

## RESULTS

Every one of student underwent exercise challenge test strictly following the protocol set for this study. Spirometry was done in each student before start of exercise and after completion of exercise.

The following parameters were recorded for each manoeuvre: forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC) and FEV1/FVC%. Base line demographics and Questionnaire outcome of students are shown in [Table 1]

**Table 1: Demographics and Questionnaire outcome**

Sex	(Male/ female)- 103/85
Age	(Mean $\pm$ SD) 19.9 $\pm$ 2.91
BMI	(mean $\pm$ SD) 20.7 $\pm$ 2.63
Resting HR	(mean $\pm$ SD) 84.3 $\pm$ 15.81
Max HR	(mean $\pm$ SD) 146.4 $\pm$ 18.90
Smokers	11/188 (5.85%)
History of asthma	17/188 (9.04%)
History of ERS	13/188 (6.91%)

On analysis of data out of participants 24 (male 13 & female 11) came to be EIB positive. 17 had history of asthma of which 15 came to be EIB positive. 13 had history of ERS of which 11 came to be EIB positive. Prevalence of EIB in our study is 12.7% as evident from [Table 2]

**Table 2: Prevalence of EIB**

Participants	EIB-positive	EIB-negative	Total
Male	13	90	103
Female	11	74	85
Total	24	164	188
%(Percentage)	12.76	87.23	100%

Spirometry data analysis is shown in [Table 3A & 3B].

**Table 3-A: The Results of Spirometry in EIB-Positive Participants (24)**

Data	Baseline	Post-exercise
%FEV1	98.9 $\pm$ 10.8	85.9 $\pm$ 9.4
%FVC	97.9 $\pm$ 12.6	92.7 $\pm$ 11.8
FEV1/FVC%	89.3 $\pm$ 4.12	84.41 $\pm$ 5.89

All values are expressed as mean with SD (Standard Deviation)

**Table 3-B: The Results of Spirometry in EIB-negative Participants (164)**

Data	Baseline	Post-exercise
%FEV1	96.7 $\pm$ 10.12	94.21 $\pm$ 10.13
FEV1/FVC%	95.5 $\pm$ 6.31	93.7 $\pm$ 6.6
%FVC	90.8 $\pm$ 9.3	88.7 $\pm$ 8.3

## DISCUSSION

The aim of our study was to investigate the prevalence of EIB in medical students by using exercise challenge test. The mechanism of EIB has not been established clearly. But it has been said that airway cooling results from the air inspired during exercise, resulting in increase in osmolarity of the fluid lining the airway leading to the release of mediators from airway inflammatory cells that causes airway smooth-muscle contraction and lead to airway edema and the airway is rewarmed after exercise.<sup>[17]</sup>

Our study showed a low prevalence of EIB in medical students as compared to athletes in a different study. Medical students got less opportunities for exposure to cold air, air pollutants and allergens as compared to athletes person, which can result in reduced inflammatory response of the airway which can probably explain the low risk for EIB in medical students as compared to athletes person.

In this study 200 students were enrolled out of which only 188 students (103 males and 85 females) completed the study. Out of 188 students 17 had history suggestive of asthma and had history suggestive of ERS. Parsons et al.<sup>[13,15]</sup> estimated a prevalence of 39% using the Eucapnic Voluntary Hyperpnea (EVH) test in college athletes, whereas Molphy et al.<sup>[16]</sup> estimated a prevalence of 13.2% using the EVH test in recreationally active individuals. In our study prevalence of EIB came to be 12.7%. EIB in student having history of asthma came to be 88.2%. EIB in student having history of ERS came to be 84.6%.

Our study has some limitations. First, the history of asthma and allergy was made on basis of history mainly. Usually allergy diagnosis should be confirmed by test like a skin prick test or a blood test including specific IgE antibodies. Second, the medical students in this study were from a single medical college hence shared a common environment.

## CONCLUSION

In our study prevalence of EIB came to be 12.7%. EIB in student having history of asthma came to be 88.2%. EIB in student having history of ERS came to be 84.6%. Those who were positive for the test were advised not to indulge in heavy sports as chances of sudden death is more in them.

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