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Original Article

Effect of Body Mass Index on Exercise Induced Asthma among Youngsters

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Abstract

Objective: Obesity has long been associated with the root cause of a number of diseases especially of cardiovascular origin. In recent years, studies were conducted to establish whether occurrence of bronchial asthma has any association with body mass index (BMI) or otherwise. Different studies have shown controversial results, some associating a direct link of BMI with asthma whereas the others were negating it. A study was designed to determine whether exercise induced-asthma (EIA) in youngsters has an association with their BMI.

Materials & Methods: A total of sixty subjects were selected. After obtaining consent, they were subjected to an exercise challenge test and a set of three criteria was set up to define EIA positive. BMI of each subject was used to categorize them as normal (BMI=18.5-24.99kg/m^2) and overweight (greater or equal to 25kg/m^2). Afterwards calculations were done in order to determine any significant difference among the two groups for developing exercise induced asthma.

Results: Out of a total of 60 subjects 26 (43.33%) were overweight whereas 34 (56.67%) came out to be in normal category. Mean age of the population was 19.69 ±0.15years and mean BMI was calculated to be 23.5±2.1 kg/m^2. A total of 19 subjects were EIA positive with 10 being normal and 9 overweight With an insignificant p value of 0.668. The remaining turned out to be EIA negative. Among these 24 were normal and 17 were overweight. It was observed that there was no significant difference in developing EIA between the 2 groups.

Conclusion: We concluded that BMI does not affect development of EIA in youngsters and therefore the clinicians are advised to focus more on the traditional proven methods of intervention for asthma.

Key Words: asthma, exercise induced asthma, obesity, BMI, EIA, body mass index

Introduction

Asthma is a respiratory disorder that has put a great workload both on outpatient and inpatient departments of teaching hospitals over the past few decades. Asthma is a chronic respiratory disorder that is diagnosed mainly on clinical grounds and central to all definitions is the presence of symptoms of variable air flow obstruction such as wheeze, chest tightness, cough and most importantly difficulty in breathing.[1] Many studies over the globe have shown a rise in asthma in overweight people.[2-4] However at the same time we have some studies that suggest asthma to be unrelated to the body mass index of individuals.[5,6] Body mass index (BMI) is a scale that is used to estimate the body build of an individual by taking into consideration two factors i.e. weight and height.[7] BMI is considered to be normal if it is between 18.5 to 24.99 kg/m^2 and if it becomes equal to or exceeds 25kg/m^2, then the person is said to be overweight.[8] Because of the varying results of the studies, it has always been difficult to establish a clear relationship between asthma and BMI. However, as we know that in the last few decades obesity and asthma have shown a concomitant increase in the western population, therefore, it is strongly suggested that the two have a potentially direct association.[9,10] Besides many factors that trigger asthma (hypersensitivity, irritants, infections, drugs, chemicals and even emotional upset), an important key factor in youngsters and adults is exercise.[11] Fewer studies are there that have specifically thrown light on the effect of BMI on exercise-induced asthma (EIA). To assess the effect of a triggers on lungs, function pulmonary function studies are done. Common lung function tests used include: Forced Expiratory Volume in the first second (FEV1) and Peak Expiratory Flow Rate (PEFR**)**. Forced Expiratory Volume in the first second (FEV1) measures the amount of air exhaled during the first second. A decrease in the FEV1 may mean there is blockage to the flow of air out of your lungs.

Obstructive pulmonary diseases, such as emphysema, asthma or chronic bronchitis, can cause reduced FEV1 values**.** Peak Expiratory Flow Rate measures how fast air is breathed out from your lungs. It reports the fastest flow rate reached during a full breath or FVC. This normally occurs near the beginning of your forced breath out. This is done primarily to follow asthma.

Keeping in view the association of asthma with BMI and also a general consideration that overweight is associated with increased morbidity and mortality in acute and chronic medical ailments; one may infer that an increase in BMI would be associated with an increase in exercise induced asthma. In order to testify this, we assessed the effect of BMI on exercise-induced asthma in young adults in our setup.

Materials and Methods

A cross sectional study was carried out at Rawalpindi Medical College and Allied Hospitals after approval by an ethical committee. A total of 60 subjects were enrolled in the study after taking informed consent. In each subject, medical history was taken and a physician performed physical examination along with 12 lead ECG and chest x ray in order to exclude any cardiovascular, pulmonary or musculoskeletal abnormality. Any subject having history of asthma or any other respiratory illness was excluded. At the same time, vital and demographic profiles of all the individuals were recorded before subjecting them to exercise. Special consideration was given to the height and weight of the subjects by which BMI of each individual was calculated by using the formula BMI=weight in kg/height in m^2. Exercise is defined as any physical activity that increases heart rate above 85% of the maximum heart rate for age, where maximum heart rate for age can be calculated by subtracting age from 220.[12] Applying this formula, the exercise challenge was given to the subjects using cycle ergometer and pulse rate was monitored using a pulse meter. Once the required heart rate was achieved, exercise was continued for a maximum of 8 minutes or till it was difficult for the subject to continue the exercise either due to exhaustion or exercise induced asthma. Pulmonary parameters were recorded using a vitalograph compact spirometer in standing position immediately after exercise and then repeated after every 5 minutes up till a maximum of 30 minutes. An exercise challenge test was considered positive if either FEV_1 (forced expiratory volume in first second) decreased by 13-15%, PEFR (Peak expiratory flow rate) decreased by 15-20% or symptoms of asthma developed. The decreases in FEV_1 and PEFR in response to exercise challenge were quantified by using the formula: % fall =baseline value-lowest value after exercise challenge X 100 / base line value. Arrangements were made to cope with any emergency situation according to recommendations of American Heart Association.[13]

After completing the study, data were analyzed by comparing the two groups, using chi square test and p-value was calculated

Results

A total of 60 subjects were included in the study. The individuals were categorized as normal (Group I) and overweight (Group II), depending upon their BMI. Those having BMI in range of 18.5-24.99 kg/m^2 were grouped as normal while those having BMI greater than or equal to 25kg/m^2 were put under overweight category. On the basis of this classification, 26 (43.33%) subjects were overweight whereas 34 (56.67%) were classified as normal. Group I had an age range of 18-25 years with a mean of 19.7 ± 1.6 years and the range of BMI was 19.4-24.3 kg/m^2 with a mean value of 22.5 ± 1.2 years.

Table 1: Age Distribution in Two Groups

Group	Age Range (Mean ± SD) (Years)	BMI Range Mean ± SD (kg/m^2)
Normal (Group I)	**18-25 (19.7 ± 1.6)**	**19.4-24.3 (22.5 ± 1.2)**
Overweight (Group II)	**18-22 (18.9 ± 1.2)**	**25-28.4 (26.5 ± 0.86)**

Table 2: Exercise induced Asthma Positivity in Overweight Group

BMI	Normal (Group I)	Overweight (Group II)	p value
EIA positive (n=19)	10	9	0.668
EIA negative (n=41)	24	17	-

The group II which was having an age range of 18 to 22 years and a mean age 18.9 ± 1.2 years and BMI of 25-28.4 kg/m^2 with a mean value of 26.5 ± 0.86 kg/m^2 as shown in table 1. After exercise challenge test a

total of 19 individuals showed a positive exercise challenge test according to the criteria described earlier. Among these 19 exercise-induced asthma (EIA) positive subjects, 10 were from the normal category whereas 9 were overweight with an insignificant p value of 0.668. The remaining 41 subjects did not fulfill the criteria of EIA diagnosis after exercise challenge test and therefore were put into a different category of EIA negative individuals. This categorization is shown in table 2.

Discussion

Over the past few years obesity has increasingly become a focus of many physicians as it is considered to be the root cause of many medical problems. It has been proved by various studies that obesity has a direct association with some of the most life threatening diseases especially of cardiovascular origin.[14] The primary purpose of our study was also to determine whether being overweight increases the likelihood of developing exercise induced asthma or more specifically exercise induced bronchoconstriction. Wright A et al suggested that BMI is directly linked with exercise induced asthma at any age.[15] However, at the other end we have many studies which are contradictory to such observations.[5,6] Henkin et al reported that BMI does not affect asthma in children.[16] Keeping in mind these two opposite views, youngsters were subjected to exercise challenge test in order to see the effect of BMI in triggering EIA. Our findings established that being overweight doesn't pound any threat of developing exercise induced asthma. Although Alicia Wright et al. examined the effect of BMI on EIA and found a positive relation between the two but unlike our study, they relied on self reporting of exercise induced asthma by the subjects that can have many shortcomings.[15] Our study is also comparable with a multicentre, prospective cohort study conducted by Thomson et al. which examined for the first time the effect of BMI on acute asthma and found out that the exacerbation episodes did not differ among the normal and overweight patients.[17]

It is difficult to understand the relationship of obesity with asthma because various studies and physiological literature review suggest that obesity is one of the factors responsible for exercise induced asthma but our results were different from such observations. It may be because of certain emerging factors that impose their effect on both obesity and asthma like use of excessive junk food not only makes a person fat but also lacks certain valuable ingredients such as antioxidants that can protect one from stimulants that trigger asthma. Sedentary lifestyle has also shown a positive relationship between asthma and BMI in certain recent studies.[18]

Our study shows that BMI does not affect exercise triggered asthma in youngsters. Our results are strengthened by the fact that uniform measures were applied to each subject and we did not rely on self reporting by the subjects.[15]

Conclusion

We concluded in our study that BMI has no effect on exercise induced asthma in youngsters and therefore clinicians are advised to stick to the proven treatment options such as avoidance of allergen and medications for control of asthma.

Suggestions and Recommendations

Multiple studies show controversial link between BMI and asthma. Hence, comprehensive studies in different age groups and in a larger population must be conducted in our set-up.

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