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Original Research Article

A comparison of 6-minute walk test distance between asthmatic children and normal healthy children

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ABSTRACT

Background: To calculate and compare the six - minute walk test distance between asthmatic children and normal healthy children.
Methods: A comparative analysis study was performed to assess the exercise capacity between asthmatic and normal healthy children in the age group of 7 to 12 years. 100 subjects with random sampling were recruited over a period of 1 year according to the inclusion and exclusion criteria, each assigned into 2 groups (n=50). All the Subjects performed the 6MWT successfully and were analysed on parameters like HR, RR, RPE and 6MWTD pre and post-test.
Results: Intergroup analysis was done using unpaired t test and level of significance was taken as $p<0.05$. The results were statistically significant for 6MWTD, HR and RR between asthmatic and normal healthy children, except RPE as no changes were seen in normal healthy children as compared to asthmatic children.
Conclusions: Asthmatic children have lower 6MWTD as compared to normal healthy children. This indicates Low exercise capacity in asthmatic children. Additionally, increased HR, RR and RPE were seen in asthmatic children pre as well as post-test.

Keywords: 6 MWT, 6 MWTD, Asthma, Asthmatic children, Normal healthy children

INTRODUCTION

Asthma is a chronic disorder of the Bronchial tree, characterized by completely or partially reversible Airway obstruction, which may improve spontaneously or may subside only after specific therapy. Airway hyper-responsiveness, is defined as narrowing of the airways in response to variety of stimuli, such as allergens, non-specific triggers and infections. Asthma is a chronic disorder of both children and adults, with 300 million individuals afflicted worldwide.[1]

Asthma symptoms include recurrent wheezing, coughing, chest tightness and dyspnea, with early morning and night symptoms being more prevalent, leading to reduced quality of life.[2] Symptoms of asthma may already occur early in life with approximately a third of children wheezing during their first 3 years of life.[3] In many children, the severity of symptoms diminishes in early puberty and may even disappear altogether, especially in those with mild asthma. however, it is widely known that symptoms may remain in children with severe asthma or return in early adulthood.[4] Asthma in older children is characterized by a histopathology of chronic inflammatory process in the conducting airways and wheezing during the previous 12 months. The International study of asthma and allergies in childhood program show prevalence in children between 5 to 6 years and 7 to 12 years as 1.6% to 36.7%.[8]

In India, prevalence of asthma is around 6% in majority of surveys. However, it has been reported to vary from 2 to 17% in different study populations. Asthma was less prevalent in developing countries, and the highest prevalence was observed in Anglo-Saxon countries.[9] Exercise induced airway obstruction is yet another burden for children with asthma, together with the frequent nocturnal awakening due to dyspnea, exercise is also a common trigger of bronchial hyper-responsiveness and may cause cough, wheezing, and chest tightness.[10] Exercise induced airway obstruction occurs in up to 23% of school children and has serious repercussions affecting the quality of life of these children.[11] It also limits participation in sports and play with 79% of children experiencing exercise induced airway obstruction as the most burdensome of their asthma.[12]

Asthmatic individuals tend to have poor physical exercise tolerance as compared to healthy individuals, due to limitations found in the practice of regular physical activity which are caused by factors such as the degree of airway obstruction at rest and the occurrence of exercise-induced bronchospasm (EIB), decreased ventilatory capacity and increased sensation of dyspnoea which determine the early interruption of physical activity and a more sedentary lifestyle.[1-3] Another limiting factor is obesity, since weight gain can cause the exacerbation of symptoms and thus, lower the tolerance to physical exercise.

Sports and play are of great importance for a child, stimulating the development of both social and motor skills.[13] Exercise induced airway obstruction may induce reluctance to exercise and a sedentary lifestyle, which in turn may lead to low cardiovascular fitness and an increased body mass index. Lower cardiovascular fitness results in higher breathing rate at a relatively low work load, which is a trigger for exercise induced airway obstruction.[14] Asthmatic fear of exercise induced asthma coupled with exercise may cause asthma exacerbations leading to recommendations that asthmatics avoid or proceed with extreme caution during exercise.

The individual response to exercise is an important clinical assessment tool because it provides a composite assessment of the respiratory, cardiac, and metabolic systems.[15] GOLD standard for assessing one's aerobic exercise response is the maximum incremental cardiopulmonary exercise test. However, most daily activities are performed at submaximal levels of exertion; thus, using submaximal functional tests would provide a more realistic simulation of one's physical capability.[16] The ability to walk for a distance is a quick, easy, and inexpensive way to assess the physical function of an individual. It is also an important component of quality of life as it reflects the ability to undertake day-to-day activities.[17] Ralf et al did a study to evaluate six minute walk distance in healthy children and proved that six minute walk test is safe, easy to perform and highly acceptable to children.[18]

Among all the functional walk tests (two min walk test, six minute walk test, twelve minute walk test, self-paced walk test and the shuttle walk test) most commonly used in cardio-respiratory domain, six minute walk test shows the strongest measurement properties.[18]

Six minute walk test is easy to administer, well tolerated by patients and does not require use of expensive equipment. It evaluates the integrated response of all the systems together involved during the exercise.[19]

The distance walked in 6 minute (6MWD) is reduced in several types of diseases like obstructive lung disease, heart failure, arthritis, and neuromuscular disease.[5] The six minute walk test is used in cardiac rehabilitation program and in the assessment of children who have to undergo lung transplantations and who are undergoing oxygen therapy.[6] Six minute walk test is a reliable and valid functional test for assessing exercise tolerance and endurance in healthy children. Cardiopulmonary exercise testing does objective determination of the functional capacity, quantifies the limiting factors and gives information about the mechanism of exercise limitation.[20]

Balke developed a simple test to examine the functional capacity by measuring the distance walked during a defined time period.[21] A 12 minute performance test was then developed to evaluate the physical fitness of healthy individuals, this test was subsequently modified for use in patients with chronic bronchitis.[22,23] To allow patients with respiratory diseases for whom walking a 12 minute distance was too demanding; a shortened version of 6 minutes, was found to provide comparable clinical information.[20] A recent review of functional walking tests concluded that the six-minute-walk test (6MWT) is easy to perform with better acceptability.[21]

The 6MWT provides information on physical performance. The 6MWTD allows an estimation of individual response to incremental maximal exercise and accurately reflects physical capacity of patients with pulmonary disease.[23] The 6MWT has been frequently used to measure outcomes before and after treatment in patients with moderate to severe heart and lung diseases.[24] It has also been used to measure cardiopulmonary functional status and in epidemiologic research. The distance covered in 6MWD has been shown to accurately predict morbidity and mortality from cardiopulmonary diseases.[2]

The American Thoracic Society pulmonary function standard committee recently developed guidelines for a 6 minute walk test in clinical settings.[43] According to these guidelines, the 6 minute walk test is easier to administer, a better reflection of daily activities and better tolerated than other walk tests. It is a useful measure of functional capacity and, in this study, both reliability and validity of the test are demonstrated.

In 2014, the European Respiratory Society (ERS) collaborated with the ATS to publish a descriptive review

and technical standard regarding the measurement properties of field walk tests in chronic respiratory disease in adults.[30] These documents suggest limits and modifications for the application of the 6 MWT in regard to track the distance and pre-test instructions and present an overview of RV prediction equations for this population.[45]

A study on assessment of exercise capacity among asthmatics and healthy adolescents was performed. When the relationships between physical performance and the responses obtained from the assessment of exercise capacity among asthmatics and healthy adolescents in the 6MWT in both Groups were evaluated, it was observed that in the healthy adolescent group, the HR was positively correlated with WD that is it increased when walking longer distances, responding to required physiological demands which matched the performances obtained in the test. However, in the asthmatic group, HR was positively correlated with BMI, highlighting the fact that weight gains in asthmatic adolescents may worsen the symptoms of the disease, resulting in greater physical inactivity and, therefore, poorer physical fitness, since a greater hr did not mean, for this group, a greater WD.[4]

A study done to define the normal 6MWD and assign reference equations in the Indian population, concluded that the mean six minute walk distance in Indians is significantly different from western population.[2]

A study to establish the reference value for 6MWT on healthy Filipino adults was undertaken and concluded that factors like age, sex, height, weight and waistline could affect 6MWD.[9] Overall different results in different studies are due to different height, weight and body mass index and physical activity level, environmental factors, lifestyle and socioeconomic status. Overall from the number of studies performed to compare six minute walk test distance in healthy children, there are very few studies done, who have compared six minute walk test distance between asthmatic children and normal healthy children. Many studies are performed in western countries and not in a developing country like India. Assessment of functional exercise capacity has gained importance in the evaluation of patients in various diseased states, as they are likely to measure the ability to do the activities of day-to-day life. Six minute walk test assesses functional exercise capacity by measuring the maximum distance the patient can walk within six minutes on a flat hard surface.[27] The six minute walk test is used as an important tool in screening, management and gives information about the prognosis of pulmonary and cardiovascular diseases.[28]

A study to evaluate six-minute walk distance in Healthy children, proved that six minute walk test is safe, easy to perform and highly acceptable to children.[29]

A study to find out the standard reference values for the six-minute-walk test in healthy children aged 7 to 16 years was done and concluded that these can be used to obtain the predicted 6MWD for individual paediatric subjects aged 7 to 16 years when performing the test for the first time using the standardized protocol. They also demonstrated that height and difference in heart rate before and after the walk test were significantly associated with 6MWD.

A study on mild to moderate asthmatic children in the age group of 6 to 16 years showed the asthmatic children walked a lesser distance as compared to normal healthy children. Most of these studies are found in asthmatic children and so we felt the need to find out the difference of six minute walk test distance between asthmatic and normal healthy children. Hence, this study is carried out to find out the reference values of the 6MWTD and compare them between normal healthy children and asthmatic children aged 7 to 12 years.

Aim

To compare six-minute walk test distance between asthmatic children and normal healthy children.

Objectives

To calculate the 6MWTD in asthmatic children. To calculate the 6MWTD in normal healthy children. To compare six-minute walk test distance between asthmatic children and normal healthy children.

METHODS

Type of study

Comparative analytic study.

Place of study

Tertiary health centre of LTMMC and GH, Sion.

Duration of study

September 2017-September 2018.

Sample size

100 - 50 asthmatic children and 50 healthy children

Sample size calculation

Experience / Previous study: P2: 65% and P1: 95%

Assuming, P1=0.51 and P2=0.545, Zβ=0.40, Zα/2=1.88, $\bar{P}$=0.78

Formula for Comparative Studies

N (Size per Group) =2 ($\bar{P}$) (1 −$\bar{P}$) (Zβ + Zα/2)2 / (P1 − P2)2

N (size per group) = 2 (0.51) (1 − 0.51) (0.40 + 1.88)2 / (0.51 − 0.545)2

Sample size = 48.60 ≈ 50 subjects in each group = 50 samples in each group

Total sample size = 100 Subjects

Type of sampling

Simple random sampling.

Inclusion criteria

Age Group 7 to 12 years involving both the gender. Diagnosis of mild to moderate Asthma according to GINA guidelines.

BMI between 5th percentile to 85th percentile.[36]

Exclusion criteria

Any Fracture within past 6 months or any musculoskeletal condition. Any cardiovascular or neuromuscular condition affecting the performance on six minute walk test. chest infections, tuberculosis or thoracic surgeries except from asthma. Acute exacerbation of asthma. Any medications that can affect the performance. Any mental defect or cognitive defect

Materials used

Chair, stop watch, sphygmomanometer, 2 small cones to mark turn around the points, weighing machine and borg scale.

Ethics

The study was approved by the ethics committee of our hospital. The subjects were included in the study from the paediatric asthma OPD of our hospital. The concerned doctor in charge was duly informed and consent was taken for every subject. Subjects were selected according to the inclusion and exclusion criteria and were informed about the aim, method of study, treatment protocol and about the protection of their rights. An informed written consent was taken from all the child's parents who participated in this study. The subjects were assigned to 2 groups: Group A (asthmatic children) and Group B (normal healthy children)

Six minute walk test

6MWT was performed on a long flat corridor with a hard surface. The walking course was 30 meter in length and turnaround points were marked with a cone. The subject was asked to sit and relax in the chair for at least 10 minutes before the test started. Pre test parameters like BP, PP, RR, RPE were noted and no warm up period was given prior to the performance of the test. The subject was asked to walk back and forth in hallway as far as possible for 6 minutes. The subject was allowed to take pauses, to stop and rest whenever they wished, but as soon as possible they would resume walking, standardized instructions were given every minute and post-test parameters were noted.[21]

Measurements

Record the number of laps from the counter (or tick marks on the worksheet). Record the Distance covered (the number of meters in the final partial lap). Then calculated the total distance walked, and record it on the worksheet. Formula: 6MWTD = 145.343 + [11.78/age(years)] + [292.22/height(m)] + [0.611/(HR(final)-HR initial)] [-2.684/weight(kg)] all the readings were taken and cumulated for analyses of data.

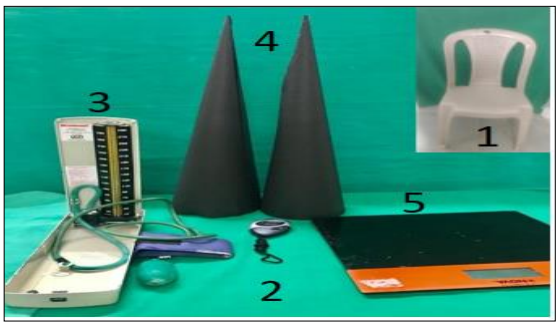

Figure 1: Materials used.

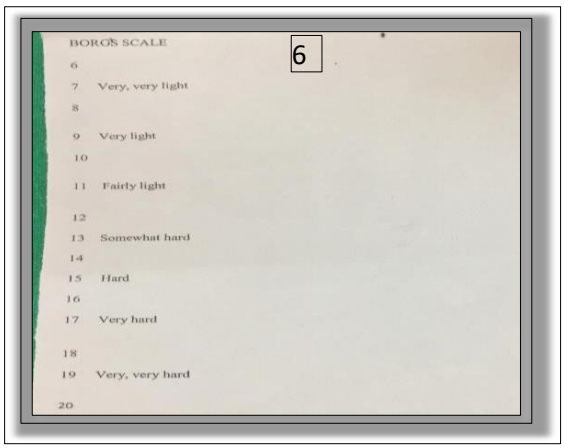

Figure 2: Borg scale.

Statistical analysis

The analysis was done on 100 subjects, 50 in each group. Group A comprised of normal children and group b comprised of asthmatic children. Both the groups were tested for 6MWT distance. Data was statistically analysed using Statistical package for social sciences (SPSS) version 20. The data was tested for normality by using Levene's t-test. Intergroup analysis was done using

unpaired t test. The Level of significance was taken as p<0.05.

Figure 3: Subject performing 6MWT.

RESULTS

Inference: 50 Asthmatic and 50 Normal Children included 25 Male and Female Subjects each respectively.

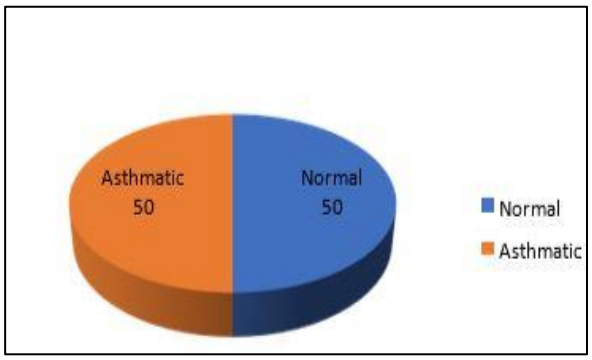

Figure 4: Distribution of asthmatic and normal healthy children.

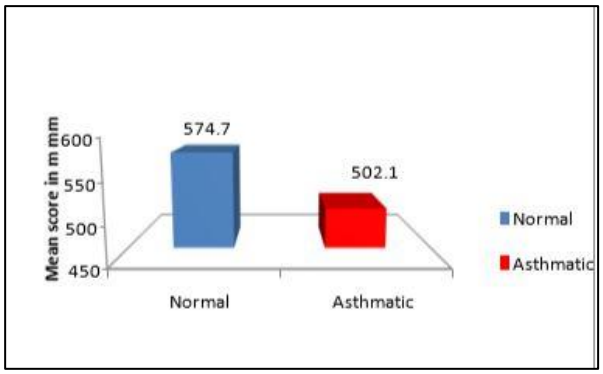

Figure 5: Comparison of 6MWTD between asthmatic and normal healthy children.

Inference: The 6MWTD covered by Asthmatic Children was 502.1 m as compared to 574.7m of Normal Healthy Children. The Average Difference between the 2 Groups is 72.60m. The Difference between the Mean of 2 Groups is statistically significant as P value is less than 0.05 (p<0.05).

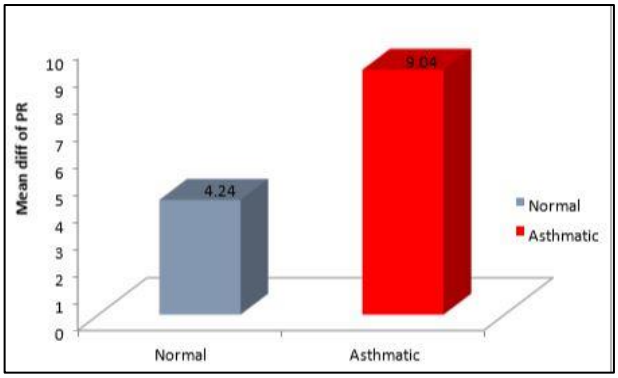

Figure 6: Comparison of pulse rate after 6MWT between asthmatic and normal healthy children.

Inference: The mean difference score of pulse rate in asthmatic children is 9.04 which is increased as compared to 4.24 of normal healthy children. The average difference between the 2 groups is 4.28. The difference between mean of 2 groups is statistically significant as p values is less than 0.05 (p<0.05).

Table 1: Comparison of respiratory rate after 6MWT between asthmatic and normal healthy children.

Group	Pre-mean RR	Post mean RR	RR Diff	Statistically significance
Asthmatic	22.30	27.42	5.12	p<0.05
Normal	22.18	25.90	3.72	

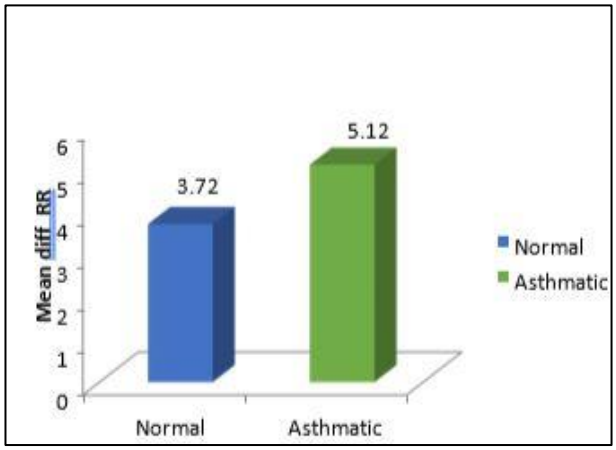

Figure 7: Comparison of respiratory rate after 6mwt between asthmatic and normal healthy children.

Inference: The mean difference score of respiratory rate in asthmatic children is 5.12 which is increased as compared to 3.7 of normal healthy children. The difference between mean of 2 groups is statistically significant as p value is less than 0.05 ($p<0.05$)

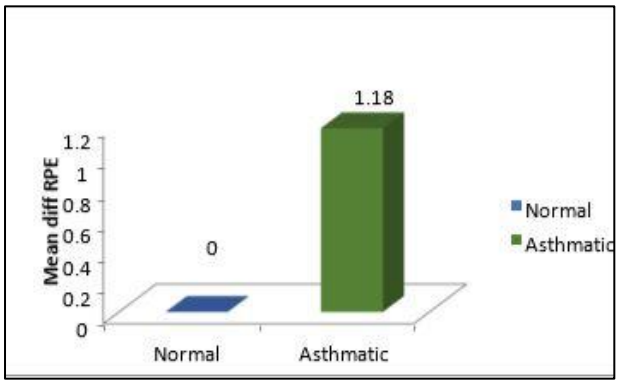

Figure 8: Comparison of rate of perceive exertion scale after 6mwt between asthmatic and normal healthy children.

Inference: The mean score of rate of perceived exertion in asthmatic children is 1.18 which is increased as compared to normal healthy children where there are no changes seen.

DISCUSSION

The aim of the study was to compare six minute walk test distance between asthmatic children and normal healthy children between the age group of 7-12 years.

In our study 100 subjects were recruited according to the inclusion and exclusion criteria. out of 100 subjects, 50 were asthmatic and 50 were normal healthy children and assigned in 2 groups. The objectives of our study were to compare 6MWTD between asthmatic and normal healthy children. In our study, all the subjects performed the six-minute walk test. The parameters like BP, PR, RR and RPE were analysed, pre-and post 6MWT and the distance covered in 6 minutes was measured. None of the Subjects took pauses in between the procedure of the test or complained of any Pain or discomfort while performing the test.

The Levene's t-test was applied to check for the normality of data of variance. Unpaired t test was used find out the difference between asthmatic children and normal healthy children groups.

In our study as per figure 4, the demographic data represents normal distribution of children in the asthmatic as well as the normal group.

In our study as per Figure 5, 6MWT mean distance for normal healthy children group was 574±140 m and for asthmatic children was 502.0±260 m, $p<0.05$. Hence, results from our study show statistically significant difference between normal healthy children and asthmatic children.

Asthmatic children tend to have poor physical exercise capacity mainly due to ventilatory limitation, muscle dysfunction and cardiovascular involvement. ventilatory limitation is caused by the combination of increased demand and decreased ventilatory capacity. Increased ventilatory demand because of increased airway resistance and decreased partial pressure of oxygen resulting in worsening of ventilation-perfusion mismatch. The decreased ventilatory capacity is due to dynamic obstruction and expiratory flow limitation leading to inefficient muscle activity, decreased elastic recoil and dynamic hyperinflation. The functional capacity of inspiratory muscle also decreases, increases the work of breathing, reduces the tidal volume and causes respiratory muscle fatigue. Asthmatics also experience exercise hypoxemia and carbon dioxide retention. in severe cases, impairment of cardiac function during exercise occurs by decreasing venous return and cardiac output. All these factors can cause limitation of daily physical activities which leads to a more sedentary lifestyle.

A study on mild to moderate asthmatic children 6 to 16 years showed that the mean distance covered by asthmatics in 6MWT distance was 430.3±116 which is closer to our asthmatic children values. Another study on assessment of exercise capacity of asthmatic children, also concluded the mean 6MWT distance as 589±63.60. A study on the effect of physical activity, sport activity and physical activity participation on asthmatic children and found the 6 MWTD mean as 654.31 (99.42). This is slightly high as compared to our study value and could be due to difference in age, height, weight and sample size. The mean distance for normal healthy children in our study was 574±140 m.

A study on six minute walk test outcome measure in children (7 to 12) years showed that the normal healthy children walked a mean distance of 609±166 m in 6 minutes. Another study done showed the overall 6MWD as 664 (65.3) m in normal healthy groups aged 7 to 16 years. 51 A study concluded that the 6MWT distance covered by normal healthy children 4 to 11 age group was 470±59 m.[52]

We had also classified gender wise distribution in both the groups. (asthmatic and normal healthy children) In our study of the asthmatic children, the mean value of 6MWTD for boys and girls was 510±24.48m and 93±44.69m. Normal healthy children had a mean value of 6MWTD for boys and girls as 581±29.88m and 567±33.23m. There was a significant gender difference in 6MWT and boys were found to have greater 6MWD than females, possibly due to their greater muscle mass and higher level of physical activity.[46]

Another study in mild to moderate asthmatic children (6 to 16 years) expressed the 6 MWTD of males as 435.4±136.7 and of females as 424.8±93.3. On carrying out a study on

six-minute walk test: reference values and equation in healthy boys aged 5 to12 years. The overall mean 6MWD was 582.26±88.2 m.[48] A study on normative values of six-minute walk distance for healthy Saudi girls 6 to 11 years concluded the overall mean of the 6MWD as 595.77±61.35 meters.[49] Another study on standard reference values for the 6 minute walk test for healthy children aged 7-16 years noted the overall 6MWD as 664 (65.3m) which was greater in males than females by 38.2m (680.9 and 642.7 m) respectively. The 6MWTD based on the gender wise distribution was different in various studies and this could be due to the lifestyle, socioeconomic status and environmental factors.

In our study as per figure 6, the mean difference of pr in normal healthy children was 4.24 and asthmatic children mean was 9.04, hence difference between two groups is statistically significant as $p<0.05$. Asthmatic patients experience shortness of breath and a sensation of asphyxiation due to bronchial constriction with simultaneously enhanced vagal drive leading to an imbalance of sympathetic/ parasympathetic influences. They also experience altered airway temperature and/or airway surface osmolarity.[52] In addition, several studies have suggested the existence of differential autonomic cardiac vagal activity that appears to be increased in asthma as demonstrated by the exaggerated cardiac response in asthma. Various emotional states and stress increase oscillatory resistance. Stress can also exacerbate airway hyperactivity and airway inflammation in bronchial asthma. Parasympathetic nerve impulses lead to increased heart rate as seen from the study.

Another study which recorded the evolution of systolic and diastolic function in asthmatic children aged 6 to16 years and found out the mean value of PR in asthmatic children as 84.68+14.93 and in normal healthy children as 86.42±10.80.

In our study as per Table 1 and Figure 7, the average difference between RR in normal healthy children mean was 3.72 and SD was 1.14 and the average difference between RR in asthmatic children mean was 5.12 and SD was 1.63. Hence, the p value was less than 0.05 and it is statistically significant.

Asthmatic children have breathlessness due to ventilatory demands increased during physical activity owing to gas exchange abnormities (i.e. alveolar ventilation-perfusion mismatch and increased dead space ventilation) which lead to hypoxemia and hypercapnia and worsens hyperinflation leading to activity limitation, deconditioning, increased co2 production, airway resistance and elastic recoil. When the exhalation time shortens due to increase in inspiratory rate there is incomplete lung emptying leading to worsening of air trapping and hyperinflation. This event can be triggered by anxiety or hypoxemia both of which cause breathing to become rapid and shallow.

In our study as per Figure 8, the average difference between RPE in normal healthy children mean was 0.00 and SD was 0.00 and the average difference between RPE in asthmatic children mean was 1.18 and SD was 0.57. The p value was 0.05 and hence, it is statistically significant.

Asthmatic children's perceived exertion was more because of respiratory discomfort. It is perceived as distressing sensation of unsatisfied Inspiration because of a mismatch between central neural drive and dynamic hyperinflation, due to increased sense of work or effort. It leads to sedentary lifestyle, deconditioning and weight gain that typically occurs with asthmatic children.

In a study similar to the present study, the score that showed the worst value was limitation of activities, where 86% had difficulty in running, 52% in climbing, and 38% in playing soccer or other sports. While there has been an increase in the incidence and prevalence of asthma in children, reduced levels of physical activity is of concern, as it may result in a growing number of asthmatic patients who will fail to achieve good health and QOL.

It was found that asthmatics are less likely than non-asthmatic peers to be active and avoid more intense or vigorous activities like running and basketball etc. Another research found that 21% of asthmatics versus 9% non-asthmatic participants did not exercise regularly. A lack of exercise in asthmatics can cause an increased risk of psychosocial problems such as low self-esteem, psychiatric disorders, poor social competence and poor school performance.

A study found that the 2 limiting factors predicting whether a child would be active for less than 30 minutes per day was the severity of asthma and if the parent believes the physical activity would exacerbate the symptoms. Parents were concerned of the impact from physical activity and so would not allow their children to participate in exercise when they believed it would worsen their symptoms.

In a study on exercise, obesity, and asthma in children and adolescents, showed that the mean distance achieved on the 6MWT was 430 meters, 170 meters below the expected mean for the group, an average of only 71% of the expected value. Clearly, having asthma (or conditions related to asthma) appears to substantially impair cardiopulmonary performance. Interestingly, the characteristics of gender, asthma severity, obesity status, and controller medication intensity were all not associated with 6MWT distance according to the study. Importantly, the only factor that was associated with 6MWT distance was the child's baseline level of activity.

In a study on the effect of six minute walk test on physiological variables among normal weight and overweight children - a quasi-experimental study, conducted in 3 different schools of 150 children aged 8-11 years. The 6MWT was administered to all the children and

the participants physiological variables (BP, HR, RR and RPE) were recorded, before and instantaneously after the test. The findings revealed that the resting SBP, DBP, HR and RR were observed to be significantly Higher ($p<0.0001$) in overweight children than normal weight children.

Thus, our study observed that the distance covered in 6 MWT of asthmatics was less as compared to normal healthy children and is an indication of low exercise capacity in asthmatic children. Additionally, increased HR, RR and RPE were seen in asthmatic children pre as well as posttest.

Limitations

Age criteria can be increased. We could not measure the Correlation between Anthropometric Measurements and 6MWT.

CONCLUSION

Based on the results and statistical analysis, the alternate hypothesis can be accepted. It can be concluded that: asthmatic children have lower 6MWTD covered as compared to normal healthy children, the average distance covered by asthmatic children was 502.0 m and normal healthy children was 574 m in the age group of 7 to 12 years. Hence, this study suggests that a lower exercise capacity is seen in asthmatic children.

Recommendations

Sample size can be increased in 7-12 years Age Group. We can use an Instrument to measure specific motivation. The reference values should be updated regularly because population characteristics may change over time.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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ANNEXURES

Case record form

A Comparison of 6 Minute Walk Test Distance between Asthmatic Children and Normal Healthy Children.

Study number:

Subject Name: Date:

Age: Sex: Male / Female

Address:

Contact: Sample Group:

BMI: Height: Weight:

Chief complains-

1)

2)

3)

Allergy to a specific component: Food, Smell, Dust, Any other: Specify the component which causes allergy to your child.

Attack of last exacerbation:

How many times in the past weeks, has your child had an exacerbation: How long did it last?

Medications: Mention the MDI/Medications? Since, when is your Child on these Medications? How many times does your Child take these Medications in a day?

Parameters

	Pre-test	Post test
BP		
PR		
RR		
Rate of perceived exertion		

Borg scale

Very, very light:

Very light:

Fairly light:

Somewhat hard:

Hard:

Very hard:

Very, very hard: