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To Study The Effects Of Bronchodilators Before And After Use In Children Of Age 5 To 12 Years With Hyperactive Airway Disease And With Special Reference To Pulmonary Function Test.

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Abstract
Objective:
1. *To clinically diagnose Hyperreactive airway disease in childrenattending with SVS Medical College, Mahabubnagar of age group 5 to 12yrs.*
2. *To perform Pulmonary Function Test before and after the use of a Bronchodilator.*

Methods: *100 children aged 5 to 12 years affected by hyperactive airway disease and those who satisfied the selection criteria of the study were enrolled. The Parameters Gender, FEV1, PEF, FVC, FEV1/FVC pre-andpost-bronchodilator were the variables studied.*
Results: *Age was included in the final model which had a reasonably high post-bronchodilator values of FEV1, PEF, FVC, FEV1/FVC irrespective of age and sex.*
Conclusion: *It is concluded that role of bronchodilator is significant in hyper reactive airway disease in children showing marked reversibility in lung functions, an early diagnosis and use of bronchodilator has a good outcome of the disease.*
Keywords: *Bronchodilators, PFT, Pulmonary Function Test, Spirometry.*

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I. Introduction

Respiratory diseases are the most common cause of death in both developed and developing countries. Bronchial asthma during childhood is a common chronic airwaydisease.

PEFR recordings are one among the many lung function tests helpful in evaluation, monitoring, management and follow-up of patients with Hyperreactive airway disease. There is enough evidence to suggest that the prevalence of this disease is increasing, consequently the morbidity and mortality of bronchial asthma is also increasing. PEFR is early measured using peak expiratory flow meter and can be recorded by the patients at home by themselves and at the clinic to reflect the severity of the out-flow obstruction and was shown to anticipate early deterioration of patient conditions before it actual happens.

Bronchial asthma is a common respiratory disease of childhood which is associated with fluctuation in airway calibre and one of the earliest sign of impending attack has a fall in PEFR.[1]

Personal best PFT is a useful concept for asthma self-management plan. Serial PFT monitoring is a convenient method for investigation and diagnosis of asthma. A variation of greater than 20 percent ofbaseline may indicate airway reactivity. The Use of bronchodilators and the relative improvement in the PFT is the basis for this study.[2] Asthma is characterized by intermittent airflow obstruction, airway inflammation, and bronchial hyperresponsiveness. This disorder affects an estimated 5 to 10 percent of the population, and as such is a major health care issue in most Western countries. A precise definition of asthma remains elusive, partly because the cause of this disease has yet to be found. Moreover, it is entirely possible that asthma is not a distinct disease, with a discrete etiology, but rather a "syndrome" with a variety of phenotypes in which various precipitating factors result in similar clinical, physiological, and pathological manifestations.

Twenty years ago, the focus for the study and treatment of asthma had emphasized the mechanisms of acute bronchospasm with the treatment directed toward control of airway smooth muscle tone, with the exception of "severe asthma," the consideration of airway inflammation as an essential component of the disease, had been largely neglected. However, with the use of fiberoptic bronchoscopy and biopsy, airway inflammation was found as an underlying feature of asthma and shifted therapeutic emphasis toward anti-inflammatory medications[3]

II. Methods

One hundred children of age group 5 to12 years of both sexes who came to SVS Medical College and hospital, Mahabubnagar,, Telangana, for treatment of clinically diagnosed hyperreactive airway disease were enrolled. Children presenting with acute onset cough without fever with past history of atleast more than two episodes of wheeze and family history of asthma.

These children were examined to rule out the following[4]
a) H/o acute respiratory tract infection with in preceding three weeks.
b) H/o chronic respiratory disease, asthma
c) H/o skeletal deformities of thorax
d) H/o cardiac and neurological disease.

The children were subjected to full clinical assessment.
PFT was measured by using Spirolab III® spirometer. All the measurements of PFT were taken in sitting position. The purpose of the test and procedure was explained to the children. Then procedure was demonstrated in detail so as to familiarize them with the procedure and to gets their fullest cooperation.

Procedures for recording forced vital capacity:

- Check the spirometer calibration
- Explain the test
- Prepare the subject

i. Ask about smoking, recent illness, medication use, etc.
ii. Measure weight and height without shoes

- Wash hands
- Instruct and demonstrate the test to the subject, to include

i. Correct posture with head slightly elevated
ii. Inhale rapidly and completely
iii. Position of the mouthpiece (open circuit)

- Exhale with maximal force
- Perform manoeuvre (closed circuit method)

i. Have subject assume the correct posture
ii. Attach nose clip, place mouthpiece in mouth and close lips around the mouthpiece.
iii. Inhale completely and rapidly with a pause of ,1sec at TLC.
iv. Exhale maximally until no more air can be expelled while maintaining an upright posture.
v. Repeat instructions as necessary, coaching vigorously
vi. Repeat for a minimum of three manoeuvres; no more than eight are usually required
vii. Check test repeatability and perform more manoeuvres as necessary.

Each child was told to take a deep breath and then blow into Spirometer, Spirolab III®, as hard and as fast as possible through mouth piece and was closely watched to ensure that he/she maintained an air tight seal between lungs and mouth piece of Instrument, this was considered as the baseline PFT. The child was then given nebulization with salbutamol (0.4mg/kg) using standard nebulizer machine, PFT was performed again after 30 minutes.
The procedure was repeated thrice, highest value of these 3 readings was taken as observed PFT.
Disposable mouth piece was used for recording of PFT for each individual child.
Statistical analysis was done for all the parameters, "p" value was determined. $p>0.05$ was considered as non-significant.

III. Results

An average value of FEV1 pre-and post-bronchodilator among boys was taken and was compared to the average value of FEV1 pre-and post-bronchodilator of the girls.
It was observed that the average pre-bronchodilator value of FEV1 among boys was 1.27 while among girls was 1.22 a difference of 0.05 and post bronchodilator average value among boys was 1.56 and among girls was 1.52 a difference of 0.04, as in table-1.
These values were statistically significant ($p<0.012$).

Sex	**Fev1(pre)**	**Fev1(post)**	**p-value**
Male	1.27	1.56	0.012,Sig
Female	1.22	1.52	
Increase	0.05	0.04	

Table-1

An average value of PEF pre-and post-bronchodilator among boys was taken and was compared to the average value of PEF pre-and post-bronchodilator of the girls.

It was observed that the average pre-bronchodilator value of PEF among boys was 2.46 while among girls was 2.30 a difference of 0.16 and post bronchodilator average value among boys was 3.14 and among girls was 2.99 a difference of 0.15, as in table-2

These values were statistically significant ($p<0.001$).

Sex	PEF (pre)	PEF (post)	p-value
Male	2.46	3.14	0<0.001,HS
Female	2.30	2.99	
Increase	0.16	0.15	

Table-2

An average value of FVC pre-and post-bronchodilator among boys was taken and was compared to the average value of FVC pre-and post-bronchodilator of the girls.

It was observed that the average pre-bronchodilator value of FVC among boys was 1.24 while among girls was 1.18 a difference of 0.06 and post bronchodilator average value among boys was 1.51 and among girls was 1.41 a difference of 0.1, as in table-3

These values were statistically significant ($p<0.001$).

Sex	FVC(pre)	FVC(post)	p-value,
Male	1.24	1.51	<0.001, HS
female	1.18	1.41	
increase	0.06	0.1	

Table-3

An average value of FEV1/FVC pre-and post bronchodilator among boys was taken and was compared to the average value of FEV1/FVC pre-and post-bronchodilator of the girls.

It was observed that the average pre-bronchodilator value of FEV1/FVC among boys was 1.03 while among girls was 1.04 a difference of 0.01 and post bronchodilator average value among boys was 1.09 and among girls was 1.10 a difference of 0.01.

These values were statistically significant ($p<0.001$).

Sex	FEV1/ FVC (pre)	FEV1/ FVC (post)	p-value,
Male	1.03	1.09	<0.001, HS
Female	1.04	1.10	
Increase	0.01	0.01	

Table-4

IV. Discussion

The sample size being 100 of which 58children were boys and 42 were girls were taken into study. All the parameters FEV1, PEF, FVC, FEV1/FVC showed a better improvement in Boys as compared with girls. P Value of < 0.001.

50% of the children of both the gender showed an improvement of 20-30%, 25% of the children showed an improvement of 10-20%, 22% of the children showed an improvement of 30-40%, 1% of the children showed more than 40% improvement and 2% showed less than 10% improvement in FEV1 post bronchodilator.

44% of the children of both the gender showed an improvement of 20-30%, 24% showed an improvement of 30-40%, 11% showed an improvement of 40-50%, 10% of the children showed an improvement of more than 50% while 11% showed 10-20% improvement in PEF post bronchodilator.

57% of the children of both the gender showed an improvement of 20-30%, 36% of the children showed an improvement of 10-20%, 4% showed an improvement of more than 30% while 3% of the children showed less than 10% improvement of less than 10% in FVC post bronchodilator.

36% of the children of both the gender showed an improvement of less than 4%, 34% of the children showed an improvement of 4-8%, 25% showed an improvement of 8-12% while 5% of the children showed an improvement of more than 12% in the value FEV1/FVC post bronchodilator.

In another study done by Bacharier and strunk*et al*. 2004, in asthmatic children between 5-18 years of age found normal FEV1 values many over 90 percent of predicted. In study by Paull *et al*. 2005, with objective

of effect of mild to moderate childhood asthma on lung growth found that FEV1 was lower for boys with asthma than for boys without asthma.[5,6]

In the present study the baseline mean FEV1 among boys was 1.27 which improved to 1.56 and baseline mean value among girls was 1.22 which improved to 1.52 post bronchodilator showing males have larger FEV1 compared to girls, which was statistically significant with a P value <0.012[7]

It is also in accordance with a recent study done by Babak Ghalibafsabbaghi*et al*, who performed PFT using Tidal breathing flow volume loop (TBFVL), Rapid thoracic compression (RTC) and Raised volume rapid thoracic compression (RVRTC) to document the bronchodilator response in 39 children (mean age 45.2 months) and showed that there was a significant improvement in FEV1, and PEF.[8]

In the present study the baseline mean PEF among boys was 2.46 which improved to 3.14 and baseline mean value among girls was 2.30 which improved to 2.99 post bronchodilator showing males have better PEF compared to girls, which was statistically highly significant with a P value <0.001[7]

In the present study the baseline FVC had a mean value of 1.21 which improved to 1.47 post bronchodilator. With a p value <0.001.

The baseline mean FVC among boys was 1.24 which improved to 1.51 and baseline mean value among girls was 1.18 which improved to 1.41 post bronchodilator showing males have better FVC compared to girls, which was statistically highly significant with a P value <0.001[7]

In the present study the baseline FEV1/FVC had a mean value of 1.03 which improved to 1.09 post bronchodilator. With a p value of <0.001.

The baseline mean FEV1/FVC among boys was 1.03 which improved to 1.09 and baseline mean value among girls was 1.04 which improved to 1.10 post bronchodilator showing males have better FEV1/FVC ratio compared to girls, which was statistically significant with a P value <0.001.[7]

V. Conclusion

From the above study it can be concluded that:

1. HRAD can be diagnosed using spirometry even in very young population.
2. Pulmonary functions are reversible using appropriate dose of bronchodilator.
3. Males have a better pulmonary mechanics as compared to females.

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