ORIGINAL ARTICLE

ASSOCIATION OF BODY MASS INDEX WITH LUNG FUNCTION IN PRE- PUBERTAL GIRLS IN VADODARA DISTRICT

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ABSTRACT

Introduction: Among the various investigations available, pulmonary function test (PFT) is a one of the important tool for the assessment of pulmonary function. There must be differences in reference values in India between different state, different region for spirometric parameters.

Methodology: The present study was conducted among normal healthy pre pubertal girl in Vadodara region. The study was conducted among pre pubertal girls (10-12 yrs). Standard anthropometric measurements weight (kg), height (cm), was measured in a beam balance. Minimum three readings were given and best of the three was chosen for analysis, based on standardization of spirometry study based on ATS/ERS task force series and various other studies.

Results: Mean age of the participants was 11.36 (±0.69) years. Similarly mean height, weight, BMI and BSA was 134.8(±8.91) cm, 28(±5.9) kg, 15.29(±2.02) (Kg/m^2), and 1.02(±0.13) (m^2) respectively. There were 27(60 %) participants with BMI <18 and 18(40%) participants with BMI >18. There was significant statistical association between BMI and FEV1 (%), FEV1/FVC (%), PEFR (%) ($P < 0.05$).

Conclusion: There is significant relation between pulmonary function and BMI in pre pubertal girls. As BMI increase lung function tends to be decrease as compared to those who have low BMI.

Key words: PFT, Spirometry, BMI, BSA

INTRODUCTION

Among the various investigations available, pulmonary function test (PFT) is a one of the important tool for the assessment of pulmonary function. Lung function test (PFT) for lungs can be comparable to the electrocardiogram (ECG) for heart.[1]

Predictive reference values are much important in clinical interpretation of these tests. Studies carried out in children had projected the equations for predicting different lung functions using anthropometric measures such as height, age and weight as independent variables in India.[2,3,4,5,6,7] and in other countries. There must be differences in reference values in India between different state, different region for spirometric parameters. As far as our research is concerned, no regional reference data for Gujarati pre pubertal girl are available. So, the this study was conducted with a purpose to obtain values for forced vital capacity (FVC), forced expiratory volume in one second (FEV1), forced expiratory volume ratio in one second (FEV1%) and peak expiratory flow rate (PEFR) among pre pubertal girl in Gujarat region of India and to know association between body mass index (BMI) and pulmonary functions in Pre pubertal girls.

METHODOLOGY

The present study was conducted among normal healthy pre pubertal girl in Vadodara region. The study was approved by ethical committee of Government Medical College, Vadodara. The prior permission of school authorities was taken and written consent from the parents of the students involved in

the study was obtained. The study was conducted among pre pubertal girls (10-12 yrs). All girls were included in this age group except those having history of (h/o) fever last14 days, respiratory illness like symptoms in last14 days, acute or chronic respiratory diseases, history of cardiac or renal problems, anaemia like symptoms, history of any drug intake which can affect lung function, allergic history, history of deformity of bone, chest or spine and any muscular weakness, significant family history of asthma, atopy, or other chronic lung diseases.

Details regarding purpose and objective of the study were explained to parents and school authorities. Data was collected by asking, and a thorough clinical examination on each girl was done to rule out any significant problems fitting the exclusion criteria. A total of 45 girls were included in the study while remaining girls were excluded due to exclusion criteria.

Standard anthropometric measurements weight (kg), height (cm), was measured in a beam balance.

All included subjects were tested in a proper sitting position with the head straight. Before testing, the procedure was explained and demonstrated to each until full familiarity was achieved. Minimum three readings were given and best of the three was chosen for analysis, based on standardization of spirometry study based on ATS/ERS task force series [8] and various other studies.[2-5,7] Each participant was told to take a deep breath and then blow into the mouth piece as hard and fast as she could. The same spirometer was used throughout the study and the tests were performed by the same technician. Data were collected and analysis was done with appropriate statistical test.

RESULT

According to table 1, mean age of the participants was 11.36 (±0.69) years. Similarly mean height, weight, BMI and BSA was 134.8 (±8.91) cm, 28 (±5.9) kg, 15.29 (±2.02) (Kg/m^2), and 1.02 (±0.13) (m^2) respectively.

According to Table 2, mean of the various respiratory parameters like FEV1, FVC, FEV1/FVC, PEFR and MVV were 1.64 (±0.33), 1.67 (±0.41), 90.87 (±9.24), 3.29 (±0.74) and 91.23 (±15.53) respectively.

According to table 3, there were 27 (60 %) participants with BMI <18 and 18 (40%) participants with BMI >18. There was significant statistical association between BMI and FEV1 (%), FEV1/FVC (%), PEFR (%) (P < 0.05).

Table 1: Anthropological data of the subjects (n=45)

Variables	Mean (±SD)
Age (Yrs)	11.26 (± 0.69)
Height (cm)	134.8 (±8.91)
Weight (Kg)	28 (± 5.9)
BMI (Kg/m^2)	15.29 (± 2.02)
BSA (m^2)	1.02 (± 0.13)

Table 2: Respiratory parameters in study participants (n=45)

Parameters	Mean (±SD)
FEV1 (Obs.)	1.64 (± 0.33)
FEV1 (%)	78.02 (± 13.51)
FVC (Obs.)	1.67 (± 0.41)
FVC (%)	78.22 (± 19.40)
FEV1/FVC (Obs.)	90.87 (± 9.24)
FEV1/FVC (%)	93.15 (± 10.01)
PEFR (Obs.)	3.29 (± 0.74)
PEFR (%)	75.8 (± 13.9)
MVV (Obs.)	91.23 (± 15.53)
MVV (%)	80.95 (± 18.78)

Table 3: Association between BMI (kg/m^2) and respiratory parameters (n=45)

Parameters	BMI (<18) (n=27) Mean±SD	BMI (>18) (n= 18) Mean±SD	P value
FEV1 (%)	83.02±13.31	74.12±12.52	0.029*
FVC (%)	83.22 ±17.3	76.22±18.32	0.200
FEV1/FVC (%)	96.99±10.92	89.25±11.02	0.025*
PEFR (%)	79.7±11.9	70.80±12.91	0.022*
MVV (%)	83.95±17.98	77.95±17.77	0.276

* P value <0.05 statistically significant

DISCUSSION

This study was conducted to know reference values for lung function from healthy pre pubertal girls of Vadodara. Variables, measured commonly in various studies were age and one or more indices like BSA and BMI. Number of variables in the reference equation depends on the various indices. For example, it is more for primary indices such as FEV1 and FVC to which both body size and age contribute than to their ratio FEV1%. The lung function reported from India and other parts of south Asia exhibit consider-

able diversity. Contributory factors are difference in race, use of various equipments and numerous environmental influences including nutrition, climate, terrain and prevalence of diseases.

Numbers of studies were carried out in country on school children to know the lung function using various anthropometric variables.

Some of them had used different variable as independent variables like age, height and weight, age and height, age and body surface area or height alone [2,4,5,9] for prediction of lung functions. This study done on pre pubertal girls has used independent variables like age, height, weight, body surface area and gender for the prediction equations of FVC, FEV1, FEV1% and PEFR.

Raju et al. (2004) conducted a study to evaluate pulmonary function that developed prediction equations in Indian girls for height, weight, sitting height and chest circumference and body surface area. They concluded that variables like height, fat free mass and chest circumference or age have shown very strong predictability of FEV1, FVC and PEFR.

Several researches have shown that parameters like FVC, FEV1, and PEFR etc. increase in accordance of age, height, body surface area etc. In present study we did not try to find out the prediction equation for the respiratory parameters in relation to age, height, weight, BSA, BMI etc.

Aundhakar et al. established a positive correlation between pulmonary function like FVC, MVV, PEFR and anthropometric parameters like age, height, weight, BSA, BMI etc.[10]

Various studies observed that individual with high BMI can impact respiratory function severely even in non-diseased individuals. The study found that as BMI increased both Functional Residual Capacity (FRC)--the volume of air in your lungs after passive exhalation--and Expiratory Reserve Volume--the volume of air you can expire after passively exhaling—decreased exponentially. Subjects who were morbidly obese were actually breathing close to their Residual Volumes--the amount of air in your lungs after forced exhalation. Another 2005 study by Medarov et. al**.** [11] According to the American College of Sports Medicine, due to increased weight on the chest wall and diaphragm obesity has mechanical effects on respiration,. Being obese also causes an increase in energy use as compared to a leaner person at the same workload, so in heavier people the respiratory muscles fatigue at lower intensities. These effects may contribute to the decreases in Functional Residual Capacity, Expiratory Reserve Volume and Total Lung Capacity. Our study also shows similar findings in pre pubertal girls that high BMI leads to impact on respiratory function.

CONCLUSION

There is significant relation between pulmonary function and BMI in pre pubertal girls. As BMI increase lung function tends to be decrease as compared to those who have low BMI.

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