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A COMPARATIVE STUDY OF PULMONARY FUNCTION OF URBAN TRIBAL AND NON-TRIBAL BOYS OF TRIPURA

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ABSTRACT

There are only a few studies that have established reference standards for pulmonary function of Indian children. Reference standards for pulmonary function that are reported for Indian children are mainly from northern and western parts of the country and there is a paucity of data on pulmonary function in normal Tripura boys. Therefore, pulmonary function tests (spirometry and maximal expiratory flow rates) were carried out in 300 urban tribal boys (150 pre-pubertal tribal and 150 post-pubertal boys) and 300 urban non-tribal boys (150 pre-pubertal and 150 post-pubertal boys). Spirometry was done by using the spirometer. Spirometer used in the study facilities the total valuation of lung function including forced vital capacity (FVC), forced expiratory volume in one second (FEV_1) and peak expiratory flow rate (PEFR). In present study, non-tribal boys found lesser lung function value in comparison to tribal boys which may be due to higher fat content. The pre-pubertal non-tribal boys lung function (FVC and FEV_1) value is similar with the finding of Gujarat boys, North India boys but lower than normal Indian children studied

KEYWORDS: Pulmonary function, forced vital capacity, peak expiratory flow rate

Pulmonary function tests are a group of procedures that measure the function of the lungs, revealing problems in the way a patient breathes. The tests can determine the cause of shortness of breath and may help confirm lung diseases such as asthma, bronchitis or emphysema. These tests are important to both physiology and clinical medicine just as cardiovascular, renal and hepatic function test. Pulmonary function is known to vary with age, sex, height, weight, race and geographic locations (Donnelly et al., 1981). FVC and FEV_1 were assessed to measure the lung capacity of child. PEFR was also assessed to monitor the severity of bronchial asthma. It is a measurement which is dependent upon several variables including airway resistance maximal voluntary muscular effort and the possible compressive effect of the maneuver on thoracic airways (Vijayan et al., 1990).

Reference standards for pulmonary function that are reported for Indian children are mainly from northern and western parts of the country (Malik and Jindal , 1985; Chowgule et al., 1995) and there is a paucity of data on pulmonary function in Tripura boys. Therefore, it is essential to have normal pulmonary function data for Tripura to interpret accurately the pulmonary function changes in childhood pulmonary diseases. A study was, therefore, planned to evaluate the pulmonary function in Tripura urban tribal and non-tribal boys.

Study Area

The present study was conducted mainly on urban tribal boys and non-tribal boys (Bengalee) residing in Agartala municipal area under West district of Tripura. Data was collected by the purposive random sampling. For the cross-sectional study, data was collected only from the different higher secondary school situated in the Agartala Municipal Council. Stratified random sampling technique was used to collect data from different school. The Agartala Municipal Council was divided into four zones (North zone, Central zone, East zone and South zone), one or two school was selected by random sampling from each zones to give due representation to all the areas. The selected schools were Assam Rifles Nodal School and Henry Derozio School from North zone, Boys Bodhjung School from Central zone, Dhaleswar School from East zone and Tripura Sport School and Saint Paul School from South zone. The selected schools were covered in Toto and the boys of 10 years and above up to the age of 17 completed years were included in the study.

MATERIALS AND METHODS

Subjects

150 pre-pubertal tribal and non-tribal boys (Avg. age 12 yrs), 150 post-pubertal tribal and non-tribal boys

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(Avg. age 15 yrs) are selected as sample for the cross-sectional study. Data was collected only from the different higher secondary school situated in the Agartala Municipality Area, West Tripura. Stratified random sampling technique was used to collect data from different schools.

Prior to pulmonary function testing, each child has assessments and investigations that included detailed history, physical examination. Children were eligible for the study, if they were ethnic Tripura, were free from respiratory symptoms at least three months before testing. Children were excluded from the study if they had structural deformity of the thoracic cage and were suffering from any acute or chronic respiratory or cardiac disease. All study subjects were non smokers.

Age at the time of last birth day, sex, ethnic identity, standing height to the nearest centimetre without shoes, weight in kilograms, smoking habits, occupation, barometric pressure and spirometric temperature were recorded in each child prior to testing. All tests were carried out in the morning after breakfast. The present cross-sectional study was conducted during the period 2006-2010.

Spirometry

The subject was asked to loosen tight clothing and was seated comfortably. The subject was instructed to take a full breath in, then close the lips around the mouth piece and blow out as hard and fast as possible. Inspiration should be full and unhurried and expiration once begins should be continued without a pause. A minimum exhalation time of 6 seconds was applied to obtain maximal FVC results. The technique was demonstrated to every subject and the result was expressed in litres in body temperature pressure saturated (BTPS). A minimum of three acceptable forced vital capacity (FVC) maneuvers were obtained. Forced vital capacity and forced expiratory volume in one second (FEV_1) of the best 2 of 3 acceptable tracings should not vary by more than ± 5% of reading or 100 ml whichever is greater. The largest of three acceptable FVC and FEV_1 volumes were recorded, even if the two values did not come from the same curve. The ratio of FEV_1 to FVC was expressed as percentage.

Statistical Analysis

Mean, standard deviation and t-test were performed to see whether any significant differences exist between the tribal and non-tribal boys in respect of pulmonary function. The study was conducted at 0.05 level of significance.

RESULTS

Mean and Standard Deviation (SD) values of the pulmonary function of urban tribal and non-tribal boys is shown in table-1 and table-2. Significant difference was observed in comparison between urban tribal and non-tribal boys in pulmonary function at baseline ($P<0.05$).

Table 1 : Comparison of the anthropometric and pulmonary function tests of pre-pubertal tribal boys and non-tribal boys

Variables		Tribal boys (n=150)	Non-Tribal boys (n=150)	t-value with the Level of significance
Age	(yrs)	12.0±0.8	12.2±0.8	NS
Height	(cm)	138.7±6.0	141.6±5.8	4.20**
Weight	(kg)	28.2±4.7	30.5±5.1	3.99**
FVC	(L)	2.15±0.26	2.05±0.22	3.92**
FEV_1	(L)	1.90±0.26	1.75±0.21	5.46**
FEV_1	%	88.3±4.0	85.3±3.1	7.22**
PEFR	(L /min)	284±42	320±40	7.59**

Values are (mean±SD) ; **, $P < 0.01$; FVC, Forced vital capacity; FEV_1, Forced expiratory volume in first second; FEV_1 % , FEV_1 expressed as per cent of FVC; PEFR, Peak expiratory flow rate

Table 2 : Comparison of the anthropometric and pulmonary function tests of post-pubertal tribal boys and non-tribal boys

Variables		Tribal boys (n=150)	Non-Tribal boys (n=150)	t-value with the Level of significance
Age	(yrs)	15.5±1.2	15.7±1.2	NS
Height	(cm)	158.0±4.7	160.6±4.6	4.82**
Weight	(kg)	41.4±4.0	43.2±6.6	2.86**
FVC	(L)	2.32±0.32	2.20± 0.21	4.08**
FEV_1	(L)	2.15±0.33	2.05± 0.22	3.32**
FEV_1	%	92.6±3.8	93.1±2.7	1.25
PEFR	(L /min)	380±47	410±28	6.67**

Values are (mean±SD); **, P < 0.01; FVC, Forced vital capacity; FEV_1, Forced expiratory volume in first second; FEV_1 % , FEV_1 expressed as per cent of FVC; PEFR, Peak expiratory flow rate

In cross-sectional study of pulmonary function of tribal and non-tribal boys, both pre-pubertal and post-pubertal tribal boys have relatively higher lung function value (except PEFR) compared to their corresponding counterpart. The differences were statistically significant (table1 and table 2).

Forced Vital Capacity (FVC)

Forced Vital Capacity (FVC) is the maximum volume of air that can be blown out at maximum speed after a full breath is taken. In the present study, pre-pubertal (2.15L±0.26) and post-pubertal (2.32L±0.32) tribal boys exhibited superior FVC value in comparison to pre-pubertal (2.05L±0.22) and post-pubertal non-tribal boys (2.20L±0.21).

Forced Expiratory Volume in First Second (FEV_1)

FEV_1 is the maximum volume of air that can be exhaled during the first second of a complete, fast, forced expiration. Compared to pre-pubertal (1.75L±0.21) and post-pubertal non-tribal boys (2.05L±0.22), pre-pubertal (1.90±0.26) and post-pubertal (2.15L±0.33) tribal boys have higher FEV_1 value.

Peak Expiratory Flow Rate (PEFR)

Peak expiratory flow rate (PEFR) is maximum flow rate achieved by the subject during the forced vital capacity maneuver beginning after full inspiration and starting and ending with maximal expiration. This is a useful measure to see if the treatment is improving obstructive diseases like broncho constriction secondary to asthma. Compared to pre-pubertal (284L/min±42) and post-pubertal tribal boys (380L/min±47), pre-pubertal (320L/min±40) and post-pubertal (410L /min±28) non-tribal boys have higher PEFR value and the difference was statistically significant. Non-tribal boys had relatively higher PEFR value in comparison to tribal boys which may be due to greater height in them, since it is known that PEFR has a significant positive correlation with height of the person.

DISCUSSION

Ethnic variations, physical activity, environmental conditions and altitude of dwelling (Cotes and Ward ,1966) tobacco smoking (Pelzer and Thomson, 1964) and changes in age, height, sex and socio-economic status (Kamat et al.,1982) can effect normal values of pulmonary function. India is a subcontinent with varying geography and with a large multi-ethnic population. Regional differences in lung functions in healthy Indians can thus be expected.

The pre-pubertal non-tribal boys lung function (FVC and FEV_1) value is similar with the finding of Gujarat boys North India boys (Malik and Jindal , 1985) but lower than normal Indian children studied by Chowgule et al., 1995.

Thus, in our study non-tribal boys which have higher fat content that may have caused have lesser lung function value in them comparison to tribal boys. PEFR

value is increased with age, height and weight (Gupta et al., 1993). Thus, in the present study the PEFR value is increased at post-pubertal stage of tribal groups (33.8 per cent) and non-tribal groups (28.1 per cent) when compared with the value of pre-pubertal tribal and non-tribal groups.

Comparing our PEFR value with previously published values (Chowgule et al., 1995), it was seen that PEFR measurements of tribal and non-tribal boys are lower than those reported for urban Indian boys of the same height it may be best explained by low levels of physical activity difference in racial, socioeconomic and genetic features and lifestyle.

Thus, results of the present study show that tribal boys in whole achieved higher value in pulmonary function test in comparison to non-tribal boys. However, PEFR value is less in tribal boys in comparison to non-tribal boys which may be due to short height in them. The FVC and FEV_1 value of present tribal boys are higher than Rajasthan tribal boys (Bhasin and Jain , 2007) of same age range.

This study establishes reference standards for predicting spirometric and maximal expiratory flow rates in Tripura boys.

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