ISSN : 2309-3234

TMSS MEDICAL COLLEGE JOURNAL

Volume 05, No. 02, July 2015

An Official Publication of TMSS Medical College, Bogra

TMSS Medical College Journal

July 2015

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of
TMSS Medical College, Bogra

TMSS Medical College Journal

Vol. 05, No. 02, July 2015

An Offical Publication of TMSS Medical College, Bogra, Bangladesh

Published by

Dr. Md. Abdul Mazid
on behalf of the TMSS Medical College

Graphic Designer

Md. Sirajul Islam
TMSS, Bogra

Printed by

TMSS Printing Press
Bogra, Bangladesh

Address of Correspondence

Executive Editor, TMSS Medical College Journal
TMSS Medical College, Rangpur Road
Thengamara, Bogra, Bangladesh.
Phone: 051-61830, Fax : 051-61830
e-mail: editortmcjournal@gmail.com
Web: www.tmssmedicalcollege.com

Comparative Study Of Peak Expiratory Flow Rate In Apparently Healthy Secondary School-Going Boys And Girls And It'S Relation With Body Weight.

Mondal CK[1]*, Begum M[2], Moniruzzaman ASM[3], Ahmed N[4], Majuumder B[5], Azam G[6] , Mostakim MA[7]

1. Dr. Chanchal Kumar Mondal, Assistant Professor, Department of Paediatrics,TMSS Medical college & Hospital , Bogra.
2. Dr. Momtaz Begum, Assistant Professor, Department of Paediatrics, Rangpur Medical College & Hospital, Rangpur.
3. Dr. A .S .M Moniruzzaman, Assistant Professor, Department of Paediatrics, Rangpur Medical College & Hospital, Rangpur.
4. Dr. Neaz Ahmed, Assistant Professor, Head, Department of Biochemistry Rangpur Medical College, Rangpur.
5. Dr. Bikash Majumder, Associate Professor, Department of Paediatrics, Rangpur Medical College & Hospital, Rangpur.
6. Dr. Md. Golam Azam, Associate Professor, Department of Paediatrics, Rangpur Medical College & Hospital, Rangpur.
7. Dr. M. A. Mostakim, Head, Department of Paediatrics, Rangpur Medical College & Hospital, Rangpur.

* Corresponding Author

Abstract

Lung function tests have been increasingly used for diagnosis, assessment and clinical management of respiratory disorders and have become an integral part of assessment of pulmonary disease. Pulmonary function values are influenced by race, age, sex, height, weight, as well as environmental, genetic, socioeconomic and technical parameters. Overweight/obesity in children and adolescent is growing problem in developed as well as in developing countries. Whereas Peak expiratory flow rate (PEFR) is simple and valuable tool in assessing the lung function. The present study was carried out to measure the peak expiratory flow rate (PEFR) in healthy secondary school going children (boys and girls) and also to find the effect of body weight on PEFR. This study was conducted on 431 apparently healthy secondary school children (185 boys, 246 girls of class nine) of seven different schools in Rangpur city. A mini Wright peak flow meter was used to measure peak expiratory flow rates. The highest of the three readings was taken as the correct value. The study was descriptive observational and cross sectional in nature with some analytical components. The relation of PEFR with sex and weight in sitting posture of children were determined by using Correlation test, Unpaired t- test and paired t-test. The mean PEFR in boys were 501.67 ± 81.49 and in girls were 354.22 ± 44.52 in sitting position. The amount of PEFR was increased regarding sex and weight. There was a positive correlation of PEFR values with weight of children (n=431). The results showed that there was a very highly significant difference of PEFR values between boys and girls ($p < 0.001$). and also a very highly significant positive correlation of PEFR values with weight for boys and girls ($p<0.001$). PEFR measurements could be useful for evaluation the functional status of the respiratory system and monitoring of children with asthma.

Key wards: Asthma; PEFR (Peak expiratory flow rate); School Children Pulmonary function tests; Forced vital capacity; Spirometry

Introduction

The peak flow meter is a useful instrument for routine monitoring of the peak expiratory fl ow rate (PEFR) in healthy and asthmatic children.[1-3] Pulmonary function tests are useful in evaluation of respiratory health of a person. These tests measure airflow rates, lung volumes and the ability of lung to transfer gases across the alveolar capillary membrane. Physiological values of pulmonary function tests vary with age, sex, height, weight, body mass index, chest circumference and smoking habit. PEFR is a good indicator of bronchial hyper responsiveness and good parameter for lung functions in obese as well as non-obese subjects.[4] Prevalence of asthma in Indian children is found to be as high as 4.75%. Pulmonary function tests of various types are utilized clinically as well as epidemiologically to measure functional status of respiratory system. Though they do not provide a specific diagnosis, they help us to understand the severity, course and progress of the respiratory diseases.[5] The peak expiratory flow rate

(PEFR) measurement is simple, reproducible and reliable way of judging the degree of airway obstruction in various obstructive pulmonary diseases, specially asthma. Peak expiratory flow rate is easily measured by using a mini-Wright's peak flow meter (mWPFM), which is easy to use, reliable and can be recorded even by the patients or by the parents at home.[6] Age, sex, weight, and height are the main factors that affect PEFR.[7] Various authors have shown that geographical, climatic, anthropometric, nutritional, and socioeconomic conditions of India are associated with regional differences in lung function.[8] Normal value of PEFR in relation to height, age, sex and weight are present in the different countries.[9] The present study is carried out to find out the relation of sex and weight with peak expiratory flow values in selected age groups of children.

Aims and objectives

1. To establish normal values of PEFR in normal children of Bangladesh and to compare between boys and girl

2. To find out the correlation of body weight of boys and girl with PEFR.

Materials and Methods

Study design: The study was cross sectional analytical in nature.

Place of study: Seven secondary schools in Rangpur city.

Study period : January 2011 to December 2012.

Study populations: Apparently healthy secondary (class nine) school going children of both sexes in different schools of Rangpur city.

Sample size: 431 subjects were included during study period.

Methods of data collection: Predesigned questionarie.

Statistical analysis: Collected data were collated and appropriate statistical analysis was done using computer based SPSS(Statistical Package for Social Sciences) in 16.0.

Inclusion criteria

1. Children of both sexes.
2. Apparently healthy secondary (Class nine) school going children of Rangpur city.
3. Age: 14 to 16 years.

Exclusion criteria

1. Children who have been suffering from asthma or having past history of asthma or wheeze.
2. Child having the thoracic deformity or history of ARI within two weeks.
3. Child having history of atopic condition like eczema, hay fever or atopic rhinitis.
4. Children having any type of heart disease.
5. Children with major respiratory disease such as congenital anomalies or thoracic surgery.

Results

The study population included 431 children from seven different high schools of Rangpur city. Table-l shows the distribution of study children according to school.

Table- I : Study population according to schools

SL.No	Name of school	No. of students	Percentage
1	Police line school and College	118	27.38
2	Govt.Girls High school	124	28.77
3	Shishu Nikaton High school	84	19.49
4	Almodina institute	16	3.71
5	Bium laboratory School	32	7.42
6	Rangpur High School	31	7.19
7	Kaylash Ronjon High School	26	6.03
Total		431	100%

Table- Il : Sex distribution

Sex	Number	Percentage	M:F ratio
Boys	185	42.92	0.75:1
Girls	246	57.08	
Total	431	100	

Table Il shows the sex distribution of study population (n=431), among which 185 and 246 were boys and girls respectively, male female ratio being 0.75:1 (girls relatively more than boys).

Table-lll: Anthropometric measurements and PEFR (l/min) of study children(n=431)

Parameters	Sex & No. of samples(n)	Mean	Standard deviation	SEE
Age (month)	Boys (n=185)	173.58	6.00	0.44817
	Girls (n=246)	171.81	11.64	0.74268
Weight (kg)	Boys (n=185)	53.59	11.93	0.87770
	Girls (n=246)	47.39	9.05	0.57717
PEFR (l/min)	Boys (n=185)	501.67	81.49	5.99152
In sitting	Girls (n=246)	354.22	44.52	2.83851

Table- lV: Comparison of baseline characteristics and PEFR by sex

Parameters	Boys Mean± SD	Girls Mean± SD	P value
Age in month	173.58 ±6.00	171.81±11.64	> 0.05
Weight in kg	53.59±11.93	47.39±9.05	< 0..001
PEFR in L/min sitting position	501.67±81.49	354.22±44.52	< 0..001

Table- lll & table lV shows the anthropometric parameters and PEFR with its descriptive statistics of 431 normal students. The mean age for the boys was 173.58±6.00 and for the girls was 171.81±11.64 months (p > 0.05). The mean weight for the boys was 53.59 ±11.93 and for the girls was 47.39±9.05 kg (p <0.001). The mean PEFR in the boys was 501.67±81.49 and the girls was 354.22 ±44.52 L/min (p<0.001) in sitting position .There was no statistically significant difference of the mean age (p>0.05) between boys and girls as all the samples were of same class (class nine). There were very highly statistically significant difference of the mean weight (p<0.001) between boys and girls. There was also very highly statistically significant difference of the mean PEFR values (p <0.001) between boys and girls both in sitting position.

Table-V: PEFR (L/min) values for boys and girls by weight range in sitting position

	Boys		Girls	
Weight in kg	Number	PEFR in sitting Mean ± SD	Number	PEFR in sitting Mean ± SD
<50	89	476.63 ± 85.96	180	351.44 ± 44.27
50 - 60.99	60	522.67 ± 71.94	47	353.62 ± 42.50
61 - 70.99	24	528.75 ± 64.22	12	381.67 ± 49.70
71 - 80.99	5	488.00 ± 50.70	6	381.67 ± 40.70
81 - 90	4	555.00 ± 105.36	1	390.00
> 90	3	560.00 ± 52.92		

Table - V show PEFR values in relation to sex and weight. The PEFR values were elevated with increasing weight. The rate of increase in boys was higher than girls. But in case of boys PEFR value in weight range 61-70.99 kg was higher than that of 71-80.99 kg. But in case of girls PEFR value in weight range 61-70.99 kg and 71.00-80.99 kg were same and close to weight range 81.00-90.00kg, this was mostly due to obesity.

PEFR in L/min

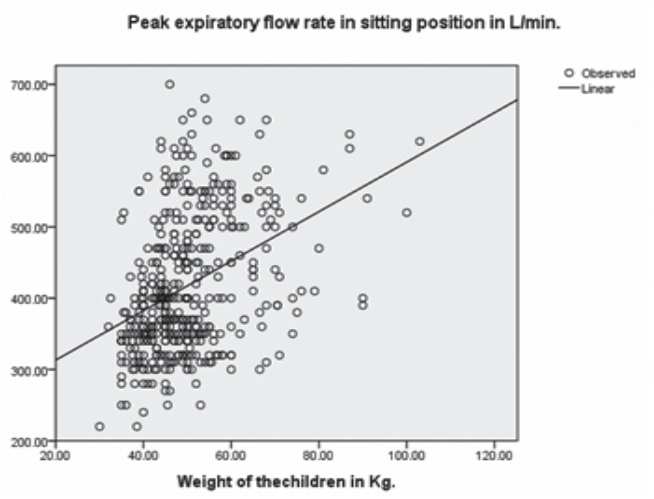

Fig. 1: Scatter diagrams depicts relationship of PEFR with weight of children (n=431) in sitting position.

Fig. 1: Scatter diagrams depicts relationship of PEFR with weight of children (n=431) in sitting position. There was a positive correlation considered PEFR as dependent and weight as independent variable. The co efficient of correlation was very highly significant (r = 0.408, p <0.001)

PEFR in L/min

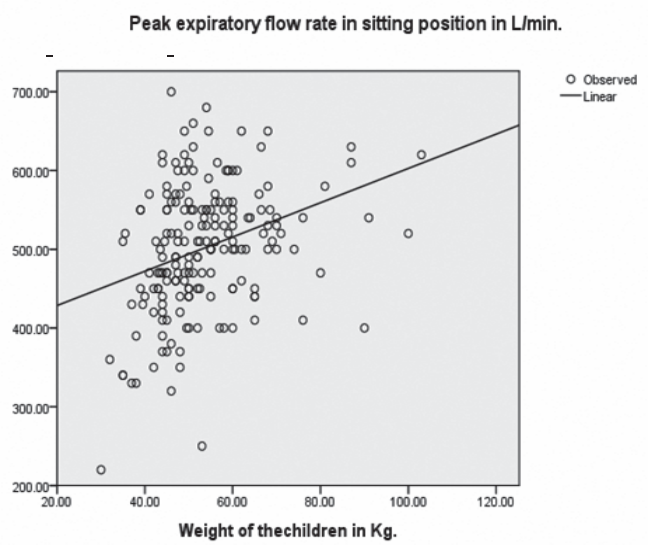

Fig.-2: Scatter diagrams depicts relationship of PEFR with weight of boys (n=185) in sitting position.

Fig.-2: Scatter diagrams depicts relationship of PEFR with weight of boys (n=185) in sitting position. There was a positive correlation considered PEFR as dependent and weight as independent variable. The co efficient of correlation was very highly significant in sitting position (r =0.319, p <0.001).

PEFR in L/min

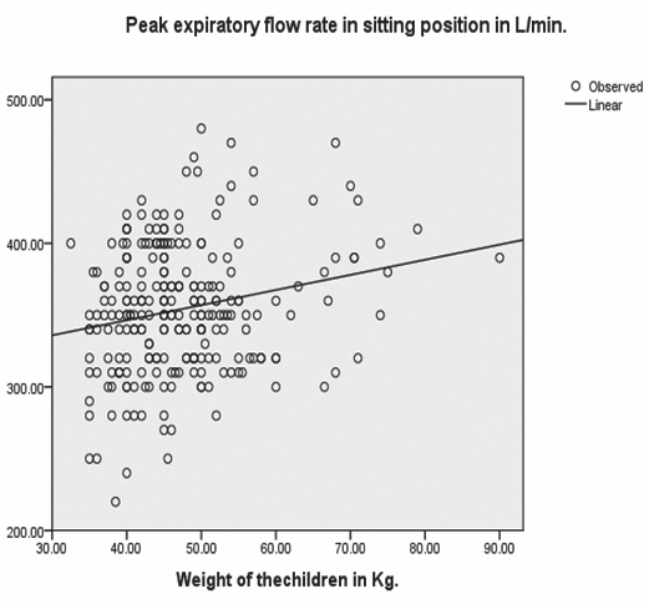

Fig. -3: Scatter diagrams depicts relationship of PEFR with weight of girls(n=246) in sitting position.

Fig.-3: Scatter diagrams depicts relationship of PEFR with weight of girls (n=246) in sitting position. There was a positive correlation considered PEFR as dependent and weight as independent variable. The co efficient of correlation was highly significant in sitting position (r =0.214 , p <0.01).

Discussion

Assessment of lung functions both qualitatively and quantatively in both healthy and diseased subjects has become important in the field of Respiratory medicine. Measurement of PEFR has gained worldwide importance in clinical practice for evaluation of patients with obstructive and restrictive airway diseases. PEFR is a simple and reliable way of monitoring the severity of bronchial asthma and assessing the response to treatment. 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.[10-12]

This Cross sectional analytical study was carried out with an aim to find out the relation of PEFR with sex, and weight in posture and also to Measure the peak expiratory flow rate in selected group of healthy secondary school going children. A total number of 431 healthy children (class nine) from 7 different schools of Rangpur city were measured during the study period. This study showed that the mean PEFR (l / min) value of boys (501.67±81.49) was higher than that of girls (354.22±44.52) in sitting position. This study showed that PEFR values increased with weight and were significantly higher in boys than girls.

PEFR measurement by peak flow meter is an easy way to assess lung capacity and ventilatory functions of the subjects. The lung function tests including PEFR are influenced by various factors such as age, body size, physical activity, and environmental condition ethnicity etc. [8,13.14]

A study was carried out in normal urban and rural school children in Ludhiana district of North India to determine pulmonary functions in the age group 6-15 years. The aim of the study was to see the correlation of lung functions with age, height, weight and sex in both urban and rural subjects. Coefficient of correlation of different parameters with age, height and weight was calculated. All the lung function parameters significantly correlated with age, height and weight .But Among all anthropometric parameters height was the most independent variable and was shown to have maximum coefficient of correlation. With an increase in height, lung function values increase in both urban and rural children. But in the same height group there was no statistically significant difference in urban and rural area. [15,16]

In this study it was observed that a highly significant positive correlation of PEFR with weight was observed in both the boys and girls which mean that the value of PEFR increased with increase in the anthropometric parameter-body weight. The PEFR (l/min) of boys and girls in relation to weight with positive correlation when PEFR was considered dependent and weight as an independent variable. Similar results were shown by various other authors which was done in the town Babol of Iran.[17–20]

Respiratory function is affected in obese children, may be due to changes in the mechanics of respiratory muscles that expand the thorax and in lung compliance and resistance, which may lead to rapid, shallow breathing, increased work of breathing and reduced maximal ventilatory capacity.[21-39]

In our study it was observed that PEFR values for both in boys and girls were elevated with increase of weight up to certain range and there after no significant change in PEFR values with increased body weight.

Conclusion

This study concluded that there was a very highly significant difference of PEFR values between boys and girls ($p < 0.001$) in sitting position and was a very highly significant positive correlation of PEFR values with weight for boys and girls in sitting position. The co-efficient correlation PEFR values for weight was highly significant. The study could serve as an important basis for preparing centile curves for PEF values for healthy Bangladeshi children and may fill the deficiency in the reference values.

Limitation of the study

1. The study was conducted only in urban area.
2. The study population was of same age group.
3. The study population was not differentiated according to economic status.

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