Original article

Gender variation in Lung function parameters in Indian Adolescents

Akshays Berad , ANR lakshmi, Sneha.P, D.Prasad.

Department of Physiology, Chalmeda Anandrao institute of medical sciences, Bommakal, Karimnagar.Telengana. India.

ARTICLE INFO

ABSTRACT

Pulmonary function test have been known to be associated with variety of factors such as Race, age, sex, height, weight, BMI and socioeconomic factors.The present study was undertaken to assess the gender difference in Lung function values like FVC,FEV1,FEV1% and MVV in Indian adolescent males and females of age group 13 to 19 years.300 healthy students were included in study .Males and females were stratified into age groups 13to15,15to17,17to19 years. They were subjected to Pulmonary function test using MEDSPIROR.The PFT parameters FVC,FEV1,FEV1%,MVV were compared in males and females.Statistical analysis was done with SPSS software.It was observed PFT parameters were significantly more in males as compared to females(P value<0.05) except FEV1 was more in females as compared to males in age group 17 to 19 years,but it was statistically insignificant(P value>0.05).The lung function values are more in males as compared to females probably because males have larger lung and muscularity than females.Study intented to show gender difference in certain lung function parameters.

1. Introduction

Pulmonary function test parameters are important in assessment of the lung function[1].This is the best diagnostic aid in the assessment of obstructive and restrictive diseases of the respiratory tract with little prognostic significance.All the studies in the literature to define the baseline pulmonary functions have been done in the western population with few been done in Indian population.The results of PFT can be influenced by a variety of factors including age ,lean body mass ,race ,age, sex, socioeconomic status etc[2]. Majority of these factors influence the muscular development of the body that directly influences the lung volumes and in turn the expiratory capacities.Though there are few studies that have been done in Indian adult population there are no studies that have been performed in the adolescent population.It is essential to have standards of PFT parameters in this age group as obstructive and restrictive diseases like asthama,

Tuberculosis present with a greater incidence in these age groups in the developing countries.Thus aim of this study was to compare and contrast the various pulmonary function parameters based on the gender in pediatric and adolescent groups[3].

2.Material and Methods

The cross sectional study was conducted in over 300 students of age groups 13 to 19   years.There was 155 males and 145 females .They were stratified in age groups

(A)   13 -15 Years

(B)   15-17 Years

©   17-19 Years

The school that was selected had students from low and middle socioeconomic group.All volunteers were subjected to general and systemic examination.Detail history was obtained .Only students who were physically healthy without any sign and symptoms were included in study.The experimental protocol was explained to all students and written informed consent was obtained from parents.Permission was taken from principal of school/junior college.The institutional ethical committee approved the study.Procedure for PFT was explained to students.PFT was carried out in comfortable sitting position and subject were encouraged to perform the test to their optimum level.Day to day calibration of medspiror machine was done regularly.

Inclusion criteria:

1)All subjects in study were from age group 13 to 19 years.

2)Both males and females were included .

3)Non smokers.

4)No history of COPD,asthama.

5)No structural deformities of thoracic cage.

FVC ,FEV1 ,FEV1% ,MVV were PFT parameters which were used.

Statistical analysis

Students t test was used to compare PFT values between males and females.The probability less than 0.05 was considered statistically significant .All calculation were done with help of SPSS version 10.02.

* Corresponding Author :   **DR AKSHAY BERAD**
Department of Physiology.
Chalmeda Anandrao institute of medical sciences,bommakal,karimnagar.
Telengana. India.
akshay_berad@rediffmail.com

3)Results :

Study was conducted in 300 subjects (155 males and 145 females) of age groups 13 to 19 years.Age is most important factor for PFT parameters.Number of males and females in each age is shown in table 1.All students were stratified into age groups A,B,C.All parameters FVC,FEV1,FEV1%,MVV were compared in males and females[4].'

• It was found that all parameters under study were significantly higher in males (Table 2). P value <0.05.

• FVC values are higher in males and are significant, P value<0.05.(Table 2,3).

• FEV1 values are higher in males and significant, P value<0.05,except in group C.(Table 3,4)

• FEV1% values are higher in males except in group C (Table 2,3)

• MVV values are higher in males in group A&B except group C and are significant P value<0.05.(Table 2,3)

• Higher FEV1,FEV1%,MVV values in C group females   shows no statistical significance.

All above results are illustrated in bar diagram 1to4.

Table 1.-Age wise and sex wise distribution of study population

Age (years)	Number of Males	Number of Females
13	16	25
14	28	47
15	51	34
16	32	25
17	19	10
18	7	4
19	2	0

Table 2.-Pulmonary function tests in male and female
Groups of the study population(mean value)

PFT Parameter	Male	Female	P Value
	Observed Value	Observed value	
FVC (In Litres)	1.81 ± 0.61	1.37 ± 0.41	0.0001*
FEV1 (In Litres / Sec)	1.41 ± 0.69	0.97 ± 0.51	0.0001*
FEV1 %	79.91 ± 27.83	73.53 ± 23.65	0.0338*
MVV (In Litres / Min)	61.09 ± 20.50	48.76 ± 16.30	0.0001*

*P value <0.05 –Highly significant.

Table 3.-Age wise distribution of PFT values(mean) in Males and Females.

Age Group	FVC (litres) MALES	FVC (litres) FEMALES	FEV1 (litres/sec) MALES	FEV1 (litres/sec) FEMALES	FEV1% MALES	FEV1% FEMALES	MVV (litres/min) MALES	MVV (litres/min) FEMALES
13-15 years	2.5169	1.3905	1.3014	1.0007	78.8098	73.3068	58.8947	48.5226
15-17 years	1.999	1.2908	1.6794	0.35028	73.3068	72.308	59.4339	49.0531
17-19 years	2.1122	1.61	1.0822	1.47	65.3322	90.3925	49.0531	52.54

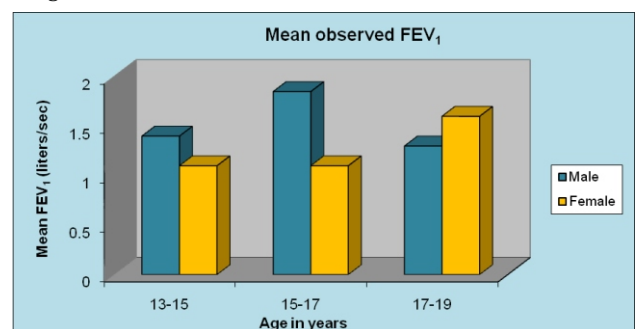Table 4.- FEV1 values (in Litres/sec.) in Males and Females of Age Group 17-19 Years

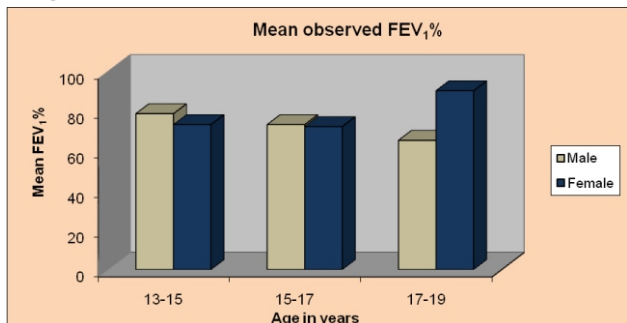| Age Group	Males. Mean FEV1 value	Males. Standard Deviation	Females. Mean FEV1value	Females. Standard Deviation	P value
17-19 Years	1.41 Litres/sec.	0.77	1.47 Litres/sec.	0.55	0.8143*

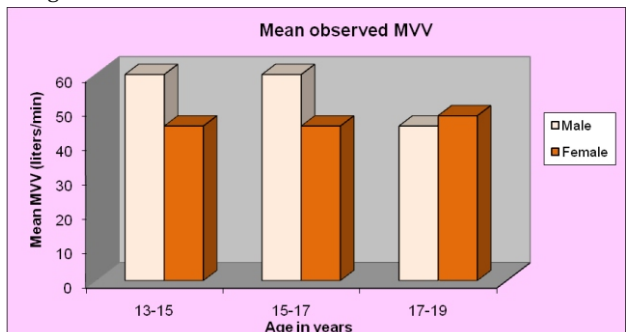*P value>0.05- Not significant.

Diagram
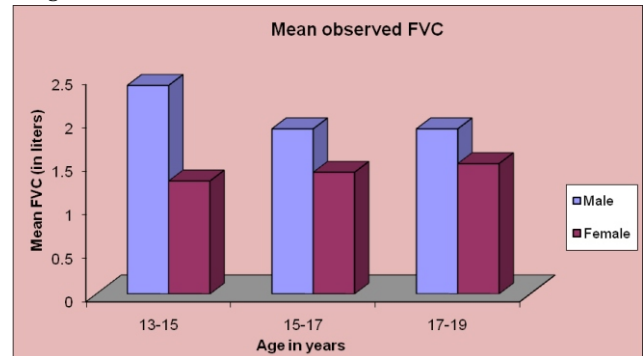
Diagram

Diagram

Diagram

4. Discussion

Age is most important factor for lung function parameters.Linear positive correlation was obtained for most of PFT parameters with age.Higher values of FEV1,FEV1% and MVV in females of age group C must be due to female sex hormone progesterone. This could be due to the fact that menstrual cycles become regular in females in C group.The progesterone levels in this C group could be factor for more values of

FEV1in females. The fluctuating hormonal level of the menstrual cycle play on broncomotor tone [5].The fact that progesterone could cause relaxation of smooth muscle of respiratory tract may be seen from study conducted by Beynon et al . The major limitation of our study is smaller sample size in C group.

Higher PFTvalues in males as compared to females were also observed by Dockery PCW et al[6].Even when males and females are matched for height,weight males have larger lungs than females.Another contributing factor could be more muscularity in males that account for higher values of PFT.

Sex hormones,sex hormone receptors or intracellular signalling pathways in addition to anatomical and physiological differences may also be responsible for gender difference in lung function values, this was observed by Anugya Behera,Basanta kumarBehera,somnath Dash,Soumya Nishra[14] .Higher PFT values in males as compared to females were also observed by Vohra RS[7].,AundhakarCD et a[8].Malik SK et al[9] .,[10]Shrivastava.,[11]Raj Kapor et al .,[12] Choughale RV .,[13] Vijayan VK et al. For this gender dependent lung size variation different normal prediction tables must be used for males and females. Over last several decades much research has been undertaken to standardise the normal values for lung volume and capacities in Indian adolescent population .This study will help to evaluate lung function mandatory before any surgery as pre anesthetic checkup.

Conclusion:

The PFT parameters studied FVC,FEV1,FEV1%,MVV were significantly higher in males as compared females. Only FEV1 values in females of C group was higher than males values because of the effect of female sex hormone level at this age. Also it was observed that PFT values in males and females were less than the predicted values for the particular age group as the subjects were from corporation schools and   undernourished probably due to low socioeconomic status . Linear positive correlation were obtained for most of PFT parameters with age..It is prospective study which will further help to find the standard lung function parameters for Asian population.

6. References:

1) Surgery encyclopedia.com spirometry test (PG/spirometry-test-html) retrieved on march 14,2010.

2) Nunn A.J and I Gregy 1989 .New regression equation for predicting peak expiratory flow in adult .Br .Med.J 298.Adapted by clement Clarke for use in Eu Scale.

3) Vijay sekharan D ,subramaniyam ,Bal Chandra,spirometry in clinical practices Indian Pediatric 2003.

4) Duckery PCW ,Berkey C.S,Ware JH,Speizer FE,Ferris BG,distribution of FVC AND FEV1 in children 6 to 11 years of age .Am Rev Respir Dis 1983,128:405-412.

5) Da silv,SB ,desousa ,Ramalho viana E ,and d souse MBC 2006 change in Respiratory strength during menstrual cycle.Res physiology and neurobiology 150 (2)211-219.

6) Card JW , Zeldin DC.Hormonal influence on lung function response to environmental agents Proc Am Thoac soc 2009.,6:588-95.Algadir A ,Aly F,Zafar H.Sex based difference in lung function of Saudi adults.J phys Ther sci 2012.,24:5-9.

7) Vohra RS ,Shah GS.Pulmonary function in normal children .Indian Pediatric 1984,21:785-790.

8) Aundhakar CD,Kasliwal GJ,Yajurvedi US,Rawat MS ,Ganeriwal SK,Sangam RN.PFT in school children .Indian J physiology pharmacology 1985 ,29:14-20.

9) Mlik SK ,Jindal SK.PFT in healthy children Indian Pediatric 1985 –sept,22:677-681.

10) Shrivastava A ,Kapoor RK .Srivastava KL,Thakur S ,Shukla N .PFT in normal Indian children and in respiratory disorders ,Indian Pediatric 1995,32(6)629-634.

11) Rajkapoor,Mahajan A,Ventilatory lung function test in school children 6-13 years.Indian J chest Dis Allied .Sci 1997,39(2)97-105.

12) Chowghule RV ,Shetye VM ,Parmar JR lung function test in normal Indian children ,Indian pediatric 1995-feb ,32:185-191.

13) Vijayan VK,Reetha AM,Kuppurao KV ,Venkatesan P,Thilakavathy S.pulmonary function in normal south Indian children aged 7-19 years.Indian J chest allied Sci 2000,42(3):147-156.

14) Anugya Behera,Basanta Kumar Behera,Somnath Dash,Soumya Mishra.Effect of BMI in lung functions in Indian Population.Short communication, ijcep.org.September 19,2015.