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Peak Expiratory Flow Rate: A Diagnostic Clinical Parameter To Diagnose Normal Aging Of The Lung

Physiology

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ABSTRACT

Background: Pulmonary function testing has become an integral part of investigations in respiratory medicine. Peak Expiratory Flow (Pef) is the highest flow achieved from maximum forced exhalation from a position of maximum inhalation.

Methods: The study was performed on normal healthy male volunteers of different age groups. Data was collected by randomly selecting in total 100 healthy non-smoking individuals.

Results: The mean PEFR values in our study population changed significantly with the variation in age on different age groups. There is a progressive decline in the mean PEFR with the increase in the age.

Conclusion: The spirometric values were higher in the younger age groups as compared to the older age groups. There was a progressive decline in the pulmonary functions with aging.

KEYWORDS

INTRODUCTION:

The increased burden of respiratory diseases like bronchial asthma and chronic obstructive pulmonary disease (COPD) has tremendously risen in the last 2 decades as a consequence to increased atmospheric pollution and unhealthy lifestyles[1].

The World Health Organization[2] in 2015 had estimated that about 3.2 million deaths are due to COPD worldwide There has been a rise of 13% in the premature deaths caused by COPD alone.[2]

Pulmonary function testing has become an integral part of investigations in respiratory medicine. Many factors influence the pulmonary functions, such as ethnic origin, physical activity, environmental conditions, altitude, tobacco smoking, age, height, sex, and socioeconomic status.[3] The environmental pollution has a great impact on the health status of the urban population. In the metropolitan city, there is a mixed diversity of people attending the outpatient department of our tertiary care hospital. Hence this present study was conducted to evaluate the pulmonary functions in the subjects Age and height remain the most important determinant variables for lung function parameters apart from gender and ethnicity. Peak Expiratory Flow (Pef) is the highest flow achieved from maximum forced exhalation from a position of maximum inhalation. Also termed as maximal expiratory flow (FEFmax) is the maximum flow attained from a maximum forced expiratory maneuver started without hesitation from a position of maximal lung inflation.

In conjunction with other spirometric variables,[4] PEF is expressed in liters per second. When performed alone using peak flow meter, it is reported in liters per minute. There is a decline in the peak expiratory flow rates as age advances.

MATERIALS AND METHODS:

The study was a prospective study performed in the Pulmonary Function Test laboratory of the department of Pulmonary Medicine in a tertiary care hospital in Mumbai. Before proceeding for the study, the required proforma & plan of the study were submitted to the Ethics committee For Research on Human Subjects of the Institute & were approved. This study was performed on normal healthy non-smoking male adults in different age groups Participants were recruited from various aspects of life, either students or employees of organization. Body measurements were taken, including the standing height and weight. All subjects were healthy individuals with no history of symptoms of cardiovascular or respiratory diseases that required treatment.

The following were the inclusion and exclusion criteria for the subjects under this study:

Inclusion Criteria:

1. Asymptomatic from respiratory and cardiovascular point of view
2. Age >18 years
3. Sex: males
4. Non smokers

Exclusion Criteria:

1. Any cardiovascular disorder
2. Any respiratory disorder
3. Chest X-ray changes
4. ECG changes
5. Hemoglobin < 9.0 gm%
6. Poor subject co-operation
7. Debilitated subjects
8. Sputum positive Pulmonary Tuberculosis
9. No h/o tobacco chewing, alcohol, any addictions
10. No h/o bony deformities of chest

Volunteers who fit into these criteria were selected and informed about the study.

A well-valid written informed consent was taken from those volunteers who agreed to participate in the study.The subject's age, height and weight (wearing indoor clothes without shoes) were recorded for calculation of reference values. Age was expressed in years.PFT was done in the department of Pulmonary Medicine in Mumbai.

EQUIPMENTS:

- Stadiometer - For measuring height.
- Weighing Scale - For measuring weight.
- The Pulmonary function tests were performed on computerized Pulmonary
- Function Test machine Med Graphics™ Cardio respiratory Diagnostic
- "BREEZE SUITE 7.1.0.32" Database Version 521 manufactured by MEDGRAFICS.

Criteria for acceptability (PEF) [5]:

1. Subject standing or sitting upright
2. Subject inhaled maximally (rapid but not forced) and exhaled maximally without holding his or her breath.
3. At least three efforts were performed and recorded in order.
4. The largest two of the three efforts were reproducible within 0.67L/s (40L/Min)
5. Largest PEF obtained is reported.

However, more than other measures, PEF is very much dependent on subject effort. With practice, reproducible results can be obtained.

Inexpensive, portable devices allow asthmatics to measure their PEF at home and monitor their status.

Statistical Analysis:

- The statistical analysis of the study was done by 'Graphpad Instat' Software, San Diego, California.
- The tabulation and interpretation along is compiled out using Microsoft Excel 2013.

RESULTS:

100 healthy male volunteers after taking permission from Institutional Ethics Committee & written informed consent form. This is a prospective, single centric, open labelled, observational study. In our study we got the following results.

"M" - MALES (M suffix is used for male group)
18-30yrs- Group 1
31-40yrs-Group 2
41-50yrs-Group 3
>50yrs-Group 4
(1, 2, 3, 4 is used for various groups. Therefore,

Mean Age wise Distribution in the Various Age Groups in Study Population.

SR NO	AGE GROUPS	NO. OF SUBJECTS	MALES
1	M1	25	23.6 ± 3.4
2	M2	25	35.7 ± 3
3	M3	25	45.3 ± 2.9
4	M4	25	64 ± 6.8

Overall mean age in the study population was 44.61± 13.28 yrs.

Mean Anthropometric Measurements In Age Wise Groups In The Study Population.

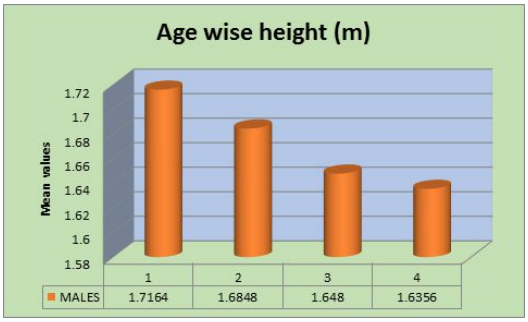
PARAMETER	AGE GROUPS	MALES	P VALUE
HEIGHT IN METERS	M1	1.71 ± 0.07	<0.0001*
	M2	1.68 ± 0.07	<0.0001*
	M3	1.64 ± 0.05	<0.0001*
	M4	1.63 ± 0.08	<0.0001*
	P value	<0.0001*	

(Foot note: All the values are expressed as Mean ± S.D. One way ANOVA with posthocTucky's test is applied, * p value <0.05 considered as significant, NS:Not significant).

The following table shows that when Mean Height(meters) was compared between different age groups of males, it was found to be statistically significant(p value<0.05).

There was statistically significant difference in the male age groups (p value<0.05).

Graph no.1: Comparison of mean height in meters in various age groups and both genders in study

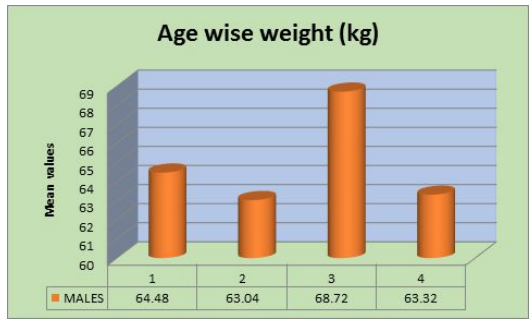


Comparison of mean weight in kgs in various age groups in study population.

PARAMETER	AGE GROUPS	MALES	P VALUE
WEIGHT IN KGS	M1	64.48 ± 6.5	<0.0001*
	M2	63.04 ± 6.4	<0.0001*
	M3	68.72 ± 11.1	<0.002*
	M4	63.32 ± 9.8	<0.007*

(Foot note: All the values are expressed as Mean S.D. One way ANOVA with posthocTucky's test is applied, p value <0.05 considered as significant).
As per the table, when Mean weight in kgs was compared between different age groups of males, it was found to be statistically significant (p value<0.05).

Comparison of mean weight in kgs in various age groups and both genders in study population.



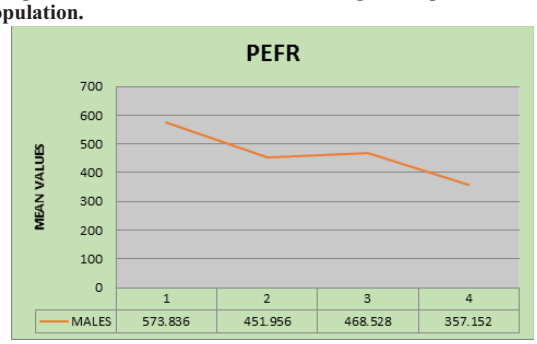
Comparison of Mean PEFR in Various Age Groups in the Study Population.

PEAK EXPIRATORY FLOW RATE		
GROUPS	MALES	P Value
1	573.84 ± 101.3	<0.0001
2	451.96 ± 119.7	<0.0001
3	468.53 ± 125.8	<0.0001
4	357.15 ± 118.5	<0.0001
P Value	<0.0001	

(Foot note: All the values are expressed as Mean ± S.D.One way ANOVA with posthoc Tucky's test is applied, p value <0.05 considered as significant).

When Mean PEFR was compared between different age groups of males, it was found to be statistically significant (p value<0.05).

Comparison of Mean PEFR in Various Age Groups in the Study Population.



DISCUSSION:

A total of 100 male subjects were included in this study after thorough history and clinical examination. All male adults above 18 years were included in study. The subjects were subdivided into various groups depending on different age groups.

There were 25 males subjects in each age groups of 18-30; 31-40; 41-50; >50 yrs age group.

- Effect of anthropometric measurements on the pulmonary function depending upon the different age groups.
- Effect of height on different age groups.

The mean height values in our study population changed significantly with the variation in age on different age groups. The mean value of height in the age group of 18-30yrs was 1.71 ± 0.07 meters in the males; in the age group of 31-40yrs it was 1.68 ± 0.07 meters in the males; in the age group of 41-50yrs was 1.64 ± 0.05 meters in the males; in the age group of >50yrs was 1.63 ± 0.08 meters in the males (Table no.4 A)

The mean height was maximum in the age group of 18-30yrs in both the males. There is a progressive decline in the mean height with the increase in the age. The mean height showed statistically significant

variation with respect to the variation in age.

The study conducted by Hisamitsu Omori et al and was concordant with the present study.

Effect of weight on different age groups:

The mean weight values in our study population changed less significantly with the variation in age on different age groups. The mean value of weight in the age group of 18-30yrs was 64.48 ± 6.5kgs in the males; in the age group of 31-40yrs it was 63.04 ± 6.4kgs in the males; in the age group of 41-50yrs was 68.72 ± 11.1kgs in the males; in the age group of >50yrs was 63.32 ± 9.8kgs in the males.(Table no.4 B).

The mean weight was maximum in the age group of 41-50yrs in both the males. There is a progressive increase in the mean weight with the increase in the age. But there was a decline in the mean weight in the males of age group>50yrs. The mean weight was found to be statistically insignificant with regards to the variation of weight with respect to the increase in the age.

Effect of PEFR on different age groups:

The mean PEFR values in our study population changed significantly with the variation in age on different age groups. The mean value of PEFR in the age group of 18-30yrs was 573.84 ± 101.3 L/ min in the males; in the age group of 31-40yrs it was 451.96 ± 119.7 L/min in the males; in the age group of 41-50 yrs;it was 468.53 ± 125.8 L/min in the males; in the age group of >50yrs it was 357.15 ± 118.5 L/min in the males.(Table no.7 D).

The mean PEFR was maximum in the age group of 18-30yrs in both the males. The variation in mean PEFR values was statistically significant in the different age groups of the study population. There is a progressive decline in the mean PEFR with the increase in the age.

The study conducted by Hisamitsu Omori et al [6] concluded that body weight and height had a substantial impact as the determinants on PEFR in female participants. Age did not act as a significant determinant on PEFR in both genders.

Shilpa Solanki et al [7] concluded that PEFR showed a decline with aging.

Ren Wei-ying et al [8] suggested that PEFR decreased significantly with age in both male and female subjects.

Pruthi et al [9] suggested that there was a significant decline in PEFR with aging.

These findings were concordant with the present study.

CONCLUSIONS:

Age dependent contribution of the anthropometric variables like height and body weight were important determinants in influencing various spirometric parameters. The spirometric values were higher in the younger age groups as compared to the older age groups.There was a progressive decline in the pulmonary functions with aging. Spirometry is an essential routine investigation to assess the pulmonary functions, to help in the diagnosis, management and progression of the respiratory disorders.

REFERENCES:

1. Report of the working group on Disease Burden (Communicable and Non-communicable diseases) for the formulation of the Twelfth Five Year Plan (2012-2017) Ministry of Health and Family welfare, Government of India.
2. World Health Organization.2015: WHO:India:Statistical profile (http://who.int/gho/mortality_burden_disease/en/).
3. K Soundariya and N. Neelambikai: Influence of Anthropometric Indices On Pulmonary Function Tests in Young IndividualsWorld Journal of Medical Sciences 9 (3): 157-161, 2013.
4. Miller MR, Hankinson J, Brusasco V, Burgos F, Casaburi R, Coates A et al. ATS/ ERS Task Force. Standardisation of spirometry. EurRespir J 2005;26:319-338.
5. McFadden ER, Linden DA. A reduction in maximum mid-expiratory flow rate, a spirographic manifestation of small airways disease. Am J Med 1972;52:725-35.
6. Omori H, Onoue A, Katoh T, Ogata Y, Kawashima H, et al. (2014) A Large Cohort Study Concerning Age-Dependent Impacts of Anthropometric 107 Variables on Spirometric Parameters in Nonsmoking Healthy Adults. PLOSONE 9(6): e100733.
7. Shilpa Solanki, RaghuveerChoudhary, KamlaChoudhary, Priyanka Mirdha, Rakesh Kumar: Study of Pulmonary Function Test in different age groups of healthy people in Western Rajasthan, Scholars Journal of Applied Medical Sciences (SJAMS) ISSN 2320-6691 (Online)Sch. J. App. Med. Sci., 2015; 3(5A):1871-1875.
8. Ren Wei-ying, LI Li, Zhao Rong-ya and ZHU Lei Age-associated changes in pulmonary function: a comparison of pulmonary function parameters in healthy young adults and the elderly living in Shanghai Chin Med J 2012;125(17):3064-3068.
9. Pruthi N.&Multani, N.K. Influence of Age on Lung Function Tests Journal of Exercise Science and Physiotherapy, Vol. 8, No. 1: 1–6, 2012.