Original Research Paper Physiology

STUDY OF VARIABILITY OF PEAK EXPIRATORY FLOW RATE IN HEALTHY YOUNG ADULT FEMALES OF CENTRAL INDIA.

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ABSTRACT

Background - PEFR is one of the ventilatory index that varies in different age groups. It is a parameter dependent on effort and is affected by various other factors like height, weight, BMI, racial differences, environmental changes . Rising levels of air pollutants and atomospheric temperature are causing physiological adaptive mechanisms to set in for maintaining homeostasis . Hence this study was taken to determine mean PEFR and its variation.

Method- 100 young adult healthy females from 18- 20 yrs of age group were selected for measuring PEFRby mini Wright's peak flow meter and 6 records were taken at 4 hourly intervals in a day .

Results –There was linear relationship with respect to height and weight in PEFR.Limit of variation in PEFR was within the normal range.

Conclusion –This study showed that height and weight are the factors affecting PEFR and has been useful in generating the normal values and variation limit of PEFR in female of age group 18- 20 yrs of central Indian region .

KEYWORDS :

Introduction-

Functional changes in the lungs are better reflected in various indices of pulmonary function tests . It is well established that sex , age , height and weight are the main factors affecting peak expiratory flow rate(PEFR),forced expiratory volume in the first second (FEV1) and Forced vital capacity (FVC). (1). Amongst these, PEFR is a simple and reliable parameter that reaches to its peak value in males at around 25-30 yrs of age and 21-25 yrs of age in females .

PEFR(lit/min)is the highest flow in first 10 milliseconds of expiration and is a measure of large airway calibre (1)

This study was taken to know variations in PEFR with height and weight in healthy young female s of similar age groups having similar sociocultural and physical activities. In developing countries, because of alarming increases in air pollution respiratory dysfunction is on rise and is responsible for much morbidity and mortality .In addition to this global warming , changing climatic conditions have also affected functioning of many human biological systems. Circadian rhythm of pulmonary functions is one of them.

Airflow limitation that varies over short periods of time, either spontaneously or in response to treatment and is associated with inflammation in the airways is characteristic of asthma (2). Though in adults failure to control airway obstruction in asthma is a risk factor for developing COPD, during childhood and early adult life , the long term airway obstruction still seems to be reversible (3)

.There is clear evidence of diurnal variation of PEFR in normal individuals and this variability is exaggerated in subjects of bronchial hyperreactivity (4). Bronchial asthma occurs at all ages but predominantly in early life. About half cases of asthma develope before age of 10 and another third cases occur before age of 40 .The male female ratio is 2:1 which equalises by the age of 30 .When a patient presents for therapy , PEFR is decreased to typically < 40 % of predicted. (3)and it is proved that bronchial responsiveness is related to presence of respiratory symptoms , and the diurnal variation in Peak EXPIRATORY flow rate has been associated with it.(5)

Bronchial tone is altered due to various factors such as age ,sex , height , weight, racial differences ,environmental factors etc. Airway resistance, a indirect measure of bronchial tone , whether assessed by FEV1 or by peak expiratory flow rate has been found to decline during the hours after waking and gradually rising till late afternoon and thereafter again falling in the early morning hours (1)The cause of this rhythm in pulmonary resistance is uncertain but a role of autonomic nervous system in has been suggested. (6) .Having these facts , we can conclude that the rhythm of airway resistance has both exogenous and endogenous components.

Our aim in this study was to know the PEFR and its diurnal variation in order to determine a normal variation limit in young healthy female individuals.

Material and methods-

This study was conducted on 18 -20yrs age group students from September to November. A total of 100 healthy young adult females were selected who meet the inclusion criteria. All were examined and asked a questioinnaire related with general and systemic examination to rule out any previous illness affecting respiratory status. Systemic examination was done to rule out any major illness. A written informed conscent was taken from all the individuals. Smokers and athletes were not included in the study. Height and weight were recorded without wearing shoes in standing position.

PEFR was measured in litres / min . with Mini Wright's Peak Flow Meter in sitting position. Each of the participant was demonstrated correct procedure to record PEFR . Three trial readings were taken of few students under supervision to show the instrumental use and were asked to record the highest reading for final record.

PEFR was noted at 4 hourly intervals from 6 : 00 am, 10 :00am ; 2:00pm 6:oopm 10:OO pm and 2:00am. Highest value amongst three readings was used for analysis .

Results-

Table 1: Correlation of PEFR with height and weight

Parameters	Correlation value	P-value
Height (cm)	0.277	< 0.001 (S)
Weight (kg)	0.194	< 0.001 (S)
BMI (kg/m^2)	-0.019	0.628 (NS)

S: Significant; NS: Not significant

The correlation between height and weight was observed with PEFR as shown in Table 1. Both the parameters showed statistically highly significant correlation with PEFR with p- value < 0.001

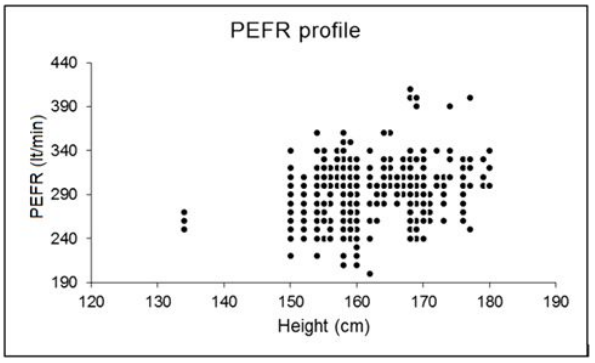

Figure1:PEFR profile according to height

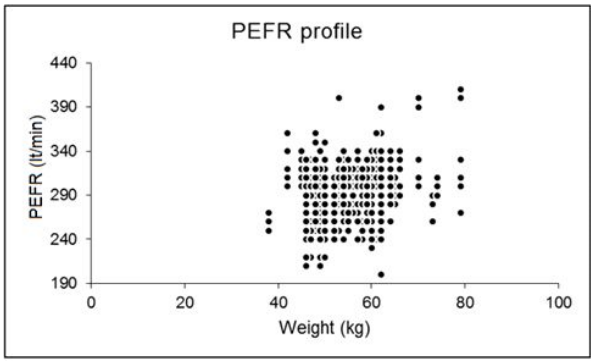

Figure 2: PEFR profile according to weight

Table 2:PEFR according to time (n=100)

Time	PEFR (L/min)	
	Mean	SE
6.00 AM	279.40[e]	2.81
10.00 AM	287.70[a]	2.68
2.00 PM	296.80[bc]	2.96
6.00 PM	306.40[d]	2.46
10.00 PM	301.00[bd]	2.95
2.00 AM	294.20[ac]	2.71

Same superscript shows statistically insignificant difference

Table 2 shows the descriptive statistics for PEFR at different time points. The mean PEFR at 6 PM was maximum i.e. 306.40 ± 2.46 L/min, while it was minimum at 6 AM in the morning i.e. 279.40 ± 2.81 L/min. A graphical representation of means with time has been given in Figure 4.

The comparison of PEFR values across time points was performed using *repeated measure analysis of variance*, which resulted into a p-value < 0.001, implying significant differences of PEFR with time. The results obtained are shown in Table 3.

Table 3: Estimates of fixed effects on PEFR according to time

Parameter	Estimate	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Intercept	307.045	16.89	**0.001**	273.54	340.55
[Time=6.00AM]	-14.80	2.99	**0.001**	-20.74	-8.86
[Time=10.00AM]	-6.50	2.96	**0.031**	-12.38	-.615
[Time=2.00PM]	2.60	3.04	0.395	-3.43	8.63
[Time=6.00PM]	12.20	2.84	**0.001**	6.56	17.84
[Time=10.00PM]	6.80	2.30	**0.004**	2.23	11.37
[Time=2.00AM]	0[b]	0			

Table 3 shows that considering 2 AM as reference point, the PEFR at 6 AM reduces by an amount 14.8 L/min, while at 10 AM, it reduces by 6.50 L/min compared to reference time. However, at 6 PM, it increases by 12.20 L/min and at 10 PM, the increase is by 6.80 L/min as compared to 2 AM.

A pair wise comparison using Bonferroni correction revealed that the difference between 6 AM and all the other time points was statistically significant. Further, the difference between 10 AM as compared to 2 PM, 6 PM and 10 PM were statistically significant. The PEFR values at 6 PM differed significantly than all other points except 10 PM.

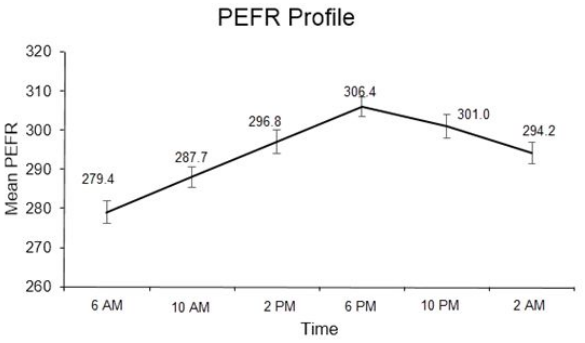

Figure 4 mean PEFR at different time points (lit/min)

Table 4 change in PEFR(in %) at different time point

	PEFR (% change)				
	6.00 am	10.00 am	2.00 pm	6.00 pm	10.00 pm
Mean	4.65	1.76	-1.30	-4.67	-2.55
Median	3.64	0.00	0.00	-6.67	-3.33
SD	9.44	9.71	10.22	9.41	7.72

Using reference of 2.00 am; (ref-x)/ref*100

DISCUSSION-

Our results were in accordance with many of the studies that have measured circadian rhythmic variations in PEFR (7, 8 ,9). They found a very identical pattern in PEFR readings like a significant fall in morning hours and a gradual rise thereafter till the evening .When we studied percent change in PEFR in a day , it is well within normal limits as all are less than 20 %. Many other investigators found mean morning values lower than in afternoon in all the females . (.,8.9,10) .

Almost all the females were in the age group of 18-20 yrs and showed a positive and statistically significant correlation of PEFR ,with the height and weight . Similar studies in north Indian women have shown positive correlation with height and weight .(11)The mean values of PEFR in their studies of same age group and height were greater than in our study . These women were from Uttarakhand and staying at high altitude may be the cause for higher values .The mean values of PEFR were lower in our subjects when compared with values of females of similar age group from Punjab and Maharashtra (12 ,13).Our values were also lower when compared against the values in Malasian women of similar age groups. (14)Aim of our study was to get the normative reference data for such young adult females of central India as they are getting same kind of environment around .The Odisha and south Indian females of similar age and anthropometric parameters had approximately similar PEFR values as in our study (9 , 15 ,) The lower values in our study group as compared to others might be because of high temperatures in central Indian region.Hence we can conclude that circadian rhythm in PEFR is a well tested, simple and easy parameter to study airway status and PEFR in young adult females has definite association with anthropometric parameters like height and weight , environmental factors, racial differences.

Acknowledgement : We sincerely extend thanks to all the students who participated in the study.

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