

Status of Peak Expiratory Flow Rate (Pefr) in Normal Basrah Population

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الملخص

خلفية المشكلة: قياس نسبة التدفق الزفيرية البالغة الذروة اقترحت كأداة مهمة تستعمل لاختبار قدرة التهوية (التنفس) في العديد من الاستطلاعات الوبائية لتقييم شدة الربو القصبي التفاعلية حسب التعليمات الدولية.

الهدف: أجريت العديد من الدراسات لقياس نسبة التدفق الزفيرية البالغة الذروة (PEFR) في الكثير من الدول ووجد اختلافات كبيرة في القيم العادية لنسبة التدفق الزفيرية البالغة الذروة ولا توجد دراسة تشير إلى هذه المعايير بالنسبة لسكان مدينة البصرة (العراق). الدراسة الحالية تهدف إلى تأسيس هذه المعايير.

طريقة البحث: هذه الدراسة أجرت على (649) شخص طبيعى من كلا الجنسين في مدينة البصرة. واستعمل جهاز Wright peak flow meter لقياس نسب التدفق الزفيرية البالغة الذروة. وسجل معدل ثلاث محاولات متعاقبة كقيمة (PEFR)، وتم قياس أطوال الأشخاص بالسنتيمتر.

النتائج: نسبة التدفق الزفيرية البالغة الذروة (PEFR) لسكان البصرة تزيد بزيادة الطول لكلا الجنسين؛ وكانت للذكور عمر فوق (15 سنة) أعلى جدا من الإناث. قيم (PEFR) لكلا الجنسين كانت واطئة جدا مقارنة مع قيمها للكشميريين والغربيين الأصحاء.

إن قيمة (PEFR) للذكور أعلى من تلك للإناث بالنسبة للأطفال (5-15) سنة بالمقارنة مع تلك للقيم للأطفال الإيرانيين. كما ان القيم المحسوبة للإناث (الأطفال) اختلفت معنويا عن القيم المقاسة.

الخلاصة: نسب التدفق الزفيرية البالغة الذروة لسكان البصرة كانت أقل من تلك التي ذكرت في بلدان المنطقة، لذا، فإن نتائج هذه الدراسة الحالية وبهذا الحجم الصغير من العينات لا تمثل خصائص حجم عينة كبيرة ويجب أن تؤخذ بنظر الاعتبار تمهيدا لدراسات أخرى مستندة على اختيار عشوائي.

الكلمات الدلالية: نسبة التدفق الزفيرية البالغة الذروة (PEFR) Wright peak flow meter.

Abstract

Background: Measuring peak expiratory flow rate has been suggested as an important tool used to test ventilator capacity in many epidemiological surveys, for assessing the severity of asthma and bronchial hyper-reactivity management by all international guidelines.

Objective: The present study was undertaken to determine the normal values of PEFR for healthy population of Basrah city, and comparison with other nations.

Methods: The study was conducted in Basrah City on (649) healthy subjects of age 5 - 75 years of either sex. A Wright peak flow meter was used to measure peak expiratory flow rates (PEFR). The mean value of PEFR achieved of three successive attempts was recorded at 10 a.m. Standing height in centimeter (cm) was measured. Calculated PEFR values were also done and compare with measured values.

Results: Peak expiratory flow rate (PEFR) of Basrah subjects linearly related to height for both sex; men above 15 year were significantly higher than women. PEFR values of both sex population were significantly lower than healthy Kashmiri and Western men and women.

The value of PEFR in male was higher than that of female children (5-15) and they showed lower values of PEFR in comparison to those for Iranian children. Calculated PEFR values for girls was found significantly higher than measured values.

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Conclusion: The peak expiratory flow rates for Basrah population were less than those reported from other countries, and the data from this sample size is not representative of characteristics of a region, therefore, the findings of the present study should be considered preliminary and call for further studies with a large sample size based on random selection

Keywords: peak expiratory flow rate (PEFR), Wright peak flow meter

Introduction

Peak Expiratory Flow Rate (PEFR) has been defined by European Respiratory Society as the maximal flow achieved during expiration delivered with maximal force starting from the level of maximal lung inflation, following maximal inspiration expressed in Liters/min.^{1,2} The Wright peak flow meter (supplied by Ferraris Development and Engineering Co. Limited (London)) is a useful instrument for monitoring PEFR in children and adults,³ and has been used to test ventilatory capacity in many epidemiological surveys, for assessing the severity of asthma and bronchial hyper-reactivity since about 40 years ago.⁴⁻⁸ In addition, it is used to measure changes which occur in pulmonary function after treatment or environmental exposures.^{9,10}

The present study was undertaken to determine the normal values of PEFR for healthy population of Basrah city, and compare with values of population of other nation.

Materials and methods

In this study 649 healthy subjects; 363 above 15 years of age (167 males and 196 females) and 286 (56 boys and 230 girls) between 5-15 years were included. PEFR were measured from April 2002 - March 2003 to subjects from center of Basrah city (school and home) where healthy state was checked from self-reports and complete and accurate medical examination. The purpose and technique of the test was explained to every subject and this was followed by demonstration of its performance. After one or two trial attempts the subject was exhorted to make a maximal effort and was closely watched to ensure that he or she maintained an airtight seal between the lips and the mouthpiece of the instrument. The mean value of PEF achieved in three successive attempts was recorded. Standing height in centimeters (cm) was measured.^{4,10}

The selection criteria of studied subjects included non smokers; no wheezy chest; no episode of acute bronchitis with no history of asthma or any clinical evidence of acute bronchitis or serious respiratory disease and no recurrent or persistent expectoration.⁴

Statistical analysis

Mean \pm standard deviation (SD) were used for demographic data as well as the correlation coefficient between PEFR with height and with age and the comparison between sex and age groups were done by one way analysis of variance (ANOVA) test, as well comparison between measured and calculated PEFR was done by using t-test according to (Steel and Terrie 1980)¹¹. Predicted PEFR values for children were calculated according to Rosenthal et al equations in either sex.¹²

* Boys (L/min)	<162.6 cm	(0.073*(height in cm))-5.98
	\geq 162.5 cm	(0.125*(height in cm))-13.14
* Girls (L/min)	<152.6 cm	(0.079*(height in cm))-6.79
	\geq 152.6 cm	(0.064*(height in cm))-3.94

Results

PEFR measurements increased with age (table 1) and the maximum value was found in 40 years age group for both male and females (Fig 2,3 and 4). Also the table shows that PEFR values for adult males are significantly higher than adult females. The table (1) indicate the height is effective factor for PEFR values for both males and females as there was a significant difference between different height groups for both sexes.

In respect to height the table (1) shows that PEFR values is only significantly correlated with the shortest height in females only. On the contrary it is significantly correlated with tallest height in males.

In children table (2) shows that there is significant difference in PEFR values for boys age groups. Similar trend was found in girls except for the youngest age group (less than 6 years). In respect to correlation there is only significant correlation between the youngest age group and PEFR value in boy only.

Due to height the PEFR showed significant increase as the height increase and the value remains at the same significant level as the height increased. This is true for both boys and girls (table 2). In respect to correlation it was observed that there is no effect of height on PEFR for children.

For prediction of PEFR for children table (2) shows that there is no significant difference in PEFR values between measured and calculated value but there is highly significant difference between values of PEFR for female children.

Discussion

The PEFR is an accepted marker of pulmonary function and widely used in respiratory medicine.

According to the American Thoracic Society many biologic sources of variation in pulmonary function exist.¹³ Interindividual variability may be due to a variety of host factors, including size (height, weight), age, race, as well as past and present health. Geographic factor, exposure to environmental and occupational pollution (including tobacco smoke), and socioeconomic status may also influence inter individual variation.^{13,14}

The PEFR values best correlated with height, age and sex, the proportionately lower in women than in man. This may be because

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of less average surface area, weight and height than in men Fig(1). PEFR were depending on age ,and maximum value were found (40) age group for both male and female Fig(2),Fig(3).

The results of our study on comparison with those of Kashmiri 15and Western population¹⁶, indicated that the PEFR values of Basrah men and women were lower than those of Kashmiri (table 3).

In children we found that the PEFR values of Basrah children were lower than those of Iranian children 17 (table 4) and its lower than these findings of other workers 8, ¹⁸⁻²⁰.

The differences between the PEFR values of the Basrah population and those of other countries can be explained by factors like genetic factors, lifestyle, diet and anthropometrical measurement as well as environmental condition 10. Beside Iraqi has been exposed to harmful toxic material through long standing war region since 1982-2003. Thus suggesting that the lung function is significantly reduced during this region because of long duration of polluted air and most of the Iraqi population do not have access to good nutrition and are living in unhygienic surroundings resulting in lower body proportions (especially at region between 1991-2003) when compared with those of other nation . Also, the less values in PEFR of Basrah city in compromise to others may be due to the high temperature and high humidity in air during most time of year.

I would like to state that a data from this sample size is not representative of characteristics of a region, therefore ,the findings of the present study should be considered preliminary and call for further studies with a large sample size based on random selection.

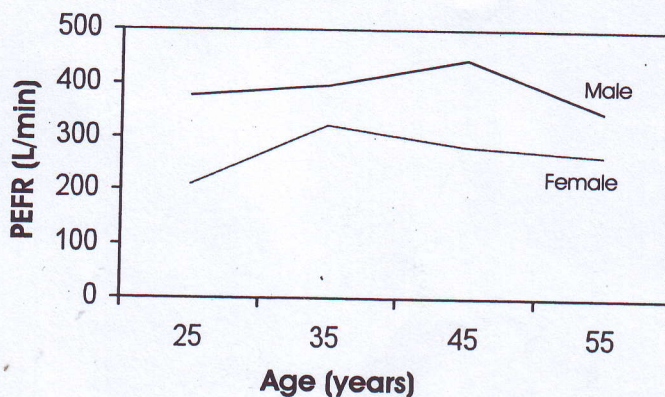


Fig (2) PEFR value for male and female in relation to age (hieghte 160-170 cm)

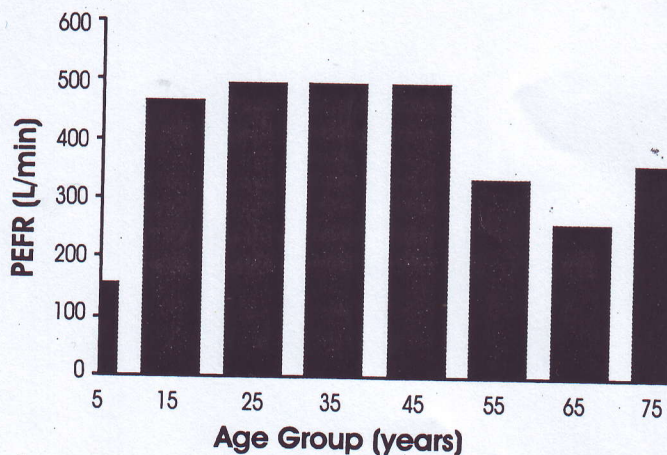


Fig (3) Peak Expirotory Flow Rate of male

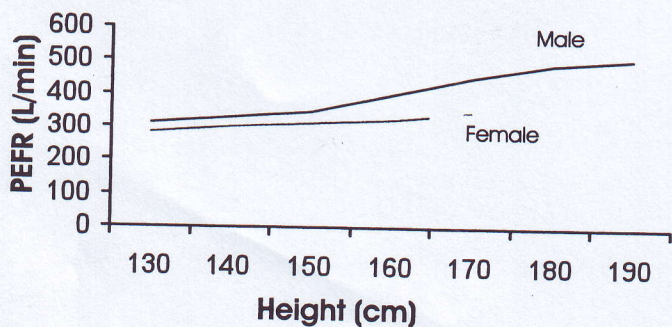


Fig (1) PEFR value for male and female in relation to hieght (Age 35 year)

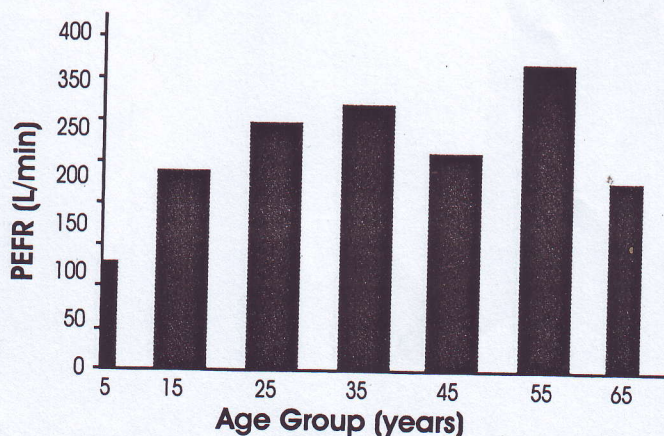


Fig (4) Peak Expirotory Flow Rate of male

Table (1): PEFR measurements for difference age and height groups for adult male and female and their correlation with age and height

factor	N	Male			r	N	Female		r
		PEFR(L/min)	SD	Mean ¹			PEFR(L/min)	SD	
Age(years)									
16-20	54	523.9815 ^A	78.9816	-0.470	119	285	98.2495	0.231*	
21 -30	28	479.7143	84.5637	-0.071	37	279.4595	89.3789	-0.029	
31-40	44	499.5455	72.1660	0.165	26	317.6923	96.0128	-0.111	
41-50	23	490.5652	85.9867	0.149	10	278.5	108.1164	0.049	
51-60	12	326.25 ^B	108.8186	-0.248	3	333.0	69.7639	-0.408	
Above 60	5	260.0 ^C	105.7450	0.55	1	200.0	0		
Height(cm)	N	Mean ²	SD	r	N	Mean ³	SD	r	
Less than130	0				2	195.0 ^A	63.6396	1**	
131-140	0				3	283.3333 ^B	57.7350		
141-150	0				19	248.4211 ^B	100.4580	0.183	
151 -160	12	438.3333 ^A	73.4641	0.14	93	284.4624 ^{BC}	87.4937	-0.136	
161-170	56	440.9107 ^A	114.5788	0.004	73	296.4932 ^{BD}	101.3950	0.043	
171-180	86	505.7558 ^B	89.5186	0.032	6	406.6667 ^E	87.7876	0.13	
More than 180	13	562.2308 ^C	46.3288	0.602*	0	0	0		
Total	167	483.5629	102.3097		196	288.2602	96.4349		

¹:LSD= 44.2672

²:LSD= 56.4750

³:LSD=48.0721

*Correlation is significant at (0.05) level (2- tailed)

** Correlation is significant (p<0.005)

Capital letter vertically means significant difference between group of 0.05 level

Table (2): PEFR measurements for different age and height groups for children(male and female) and their correlation with age and height. And comparison between calculated an measured PEFR values

Factor	Male				Female			
	N	Mean ¹	SD	r	N	Mean ²	SD	r
Age(years)								
Less than 6	10	97 ^A	38.8873	0.705*	6	96.6667	47.6295	0.703
6-10	33	176.9697 ^B	58.4292	0.28	10	154 ^A	57.5809	0.298
11-15	13	276.5385 ^C	76.3049	0.144	214	221.1682 ^B	70.9049	0.1
Height(cm)								
<=100	6	98.3333 ^A	51.9294	0.689	2	50 ^A	0	0.214
101-110	8	140.6250 ^B	55.1904	0.657	7	120 ^{AB}	47.2582	0.862
111-120	13	153.6764 ^B	44.6065	0.093	3	163.333 ^{BC}	70.946	---
121-130	12	242.5 ^C	50.1135	-0.191	0	0	0	-0.349
131-140	10	212.5 ^C	71.6182	-0.584	10	233.5 ^C	71.494	.102
141-150	4	240 ^C	58.3095	0.457	69	203.6232 ^C	65.8407	.105
More than 150	3	235 ^C	220.9638	-0.957	139	227.5899 ^C	72.2374	
PEFR(measurement)	56	185.8036	83.2509	0.457**	230	215	73.6272	0.285
PEFR(estimate)***	56	191.4611	91.8420	0.981**	230	326.0828	68.0731	0.984**
L/min								

1:LSD=79.9697

2:LSD=67.1682

3:LSD=54.7436

4:LSD=81.6418

* Correlation is significant (0.05)level

**Correlation with height is significant (p<0.005)

***Calculated according to Rosenthal et al (12)

Capital letter vertically means significant difference between group of 0.05 level

Table (3) Mean PEFR in Basrah males and females compared with those in Kashmiri

	Kashmiri		Basrah	
	n	PEFR(L/min) mean±SD	n	PEFR (L/min) mean±SD
Males	350	530 ± 55	167	483 ± 63
Females	120	348 ± 46	196	289 ± 96

Table (4) Mean PEFR in Children for Basrah population compared with those in Tehran

	Tehran		Basrah	
	n	PEFR(L/min) mean±SD	n	PEFR(L/min) mean±SD
Boy	768	297 ± 79	56	225 ± 84
Girls	767	289 ± 62	230	215 ± 73

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