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PEAK EXPIRATORY FLOW RATE AND ITS CORRELATION WITH WEIGHT IN NORMAL SCHOOL CHILDREN

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ABSTRACT: *Aims:* The aim of this study was to correlate the "PEAK EXPIRATORY FLOW RATE" as measured by miniature Wright Peak Flow Meter in normal school children between 5 – 18 years with Weight.
Objectives: This study was done to correlate Weight of healthy school children with PEFR.
Study area: R.G.M. School Sindhanur.
Study design: This is an observational study of 495 urban school going healthy children from SINDHANUR. This sample comprised of 268 boys and 227 girls in the age range of 5- 18 years.
Results: PEFR increases progressively with increase in Weight. The correlation of PEFR with Weight was statistically significant.
Conclusion: The present study has led to the following conclusions.
A. There is a positive and statistically significant correlation between PEFR and Weight in the sample of children selected.
B. Weight has a less closer correlation with PEFR than height.

KEYWORDS: Peak Expiratory Flow Rate (PEFR), Peak Flow Meter, S.D. (Standard Deviation), C.V. (Coefficient of Variation), S.E.M. (Standard Error of Mean).

1 INTRODUCTION

Rapid advances in technology since the beginning of this century have enabled a better understanding of physiological principles underlying pulmonary function. The pulmonary function tests have not only widened the knowledge about the functional capability of the lungs in normal healthy persons but also have made it possible to assess the functional abnormalities in persons with restrictive and obstructive airway disorders both qualitatively and quantitatively. The important functional abnormality in patients disabled by asthma, bronchitis, emphysema and other COPDs (Chronic Obtructive Pulmonary Disorders) is the difficulty in expiration. Hence the measurement of Peak Expiratory Flow Rate (PEFR) has gained world wide acceptability as a method for identification, assessment, rational therapy and followup of such patients.

PEFR is defined as the maximal expiratory flow rate which can be sustained by a subject for at least 10 milliseconds during forced expiration starting from total lung capacity. PEFR is expressed in litres/min. PEFR is influenced by various factors such as age, sex, height, weight, body surface area, environmental and ethnic differences. The measurement of PEFR is of value

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for the identification of chronic obstructive bronchitis and for assessment and follow up of patients with asthma.It is also very useful in the assessment of severity of airway obstruction. The Wright Peak Flow Meter, which was designed as a simple and reliable device is used for measuring PEFR. This instrument has undergone many changes and reached its present form known as the miniature Wright Peak Flow Meter. For the purposes of evaluation of an observed reading of PEFR, a knowledge of its range in normal subjects of the same sex, age and body size is required.

2 MATERIALS AND METHODS

2.1 MATERIALS

SELECTION OF SUBJECTS:

The present study reports normal values for PEFR in 495 normal children from 5 – 18 years of age, measured using a miniature Wright Peak Flow Meter (MWPFM). These children constitute a representative cross section of normal school children. Students of both sexes were selected randomly from the primary, middle and high school (of R.G.M.School Sindhanur)

The following criteria were employed for acceptance as a Normal subject.

1) No history of cardiopulmonary disease.

2) No clinical evidence of cardiopulmonary disease.

3) No history or evidence of any other disease which could be expected to affect pulmonary function.

4) Capable of adequate co-operation.Children willing to participate with the consent of parent/guardian.

THE INSTRUMENT:

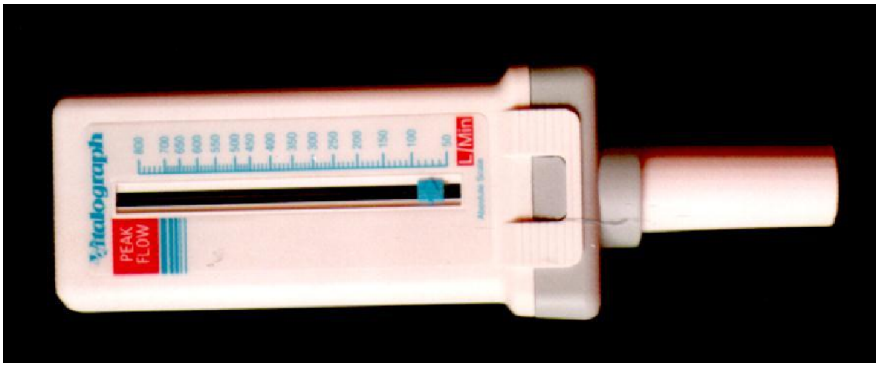

Fig. 1. Wright Peak Flow Meter

PEAK FLOW METER:

Background: The Peak flow meter was introduced in 1959 by B.M.Wright. This device became popular soon after, but was expensive, cumbersome & too sensitive for routine clinical use. However the concept of Peak flow rate caught on and efforts to develop a cheaper, simple and portable instrument to measure the same got under way. Thus was born in 1969, the miniature Wright Peak Flow Meter, commercial production of the same began in 1977.

THE MINI WRIGHT PEAK FLOW METER:

The mini Wright peak flow meter operates on a spring loaded piston and a longitudinal slot as a variable orifice, which carries a rider or marker as Peak flow indicator. These are housed in a cylindrical plastic frame of dimension 5.0 cm diameter and 15 cms length. The instrument weighs 75 gms.

OPERATION AND USE:

Air blown into mouth piece cannot escape until it has moved and uncovered part of the longitudinal slot. When the area of the slot uncovered is such that the pressure behind the piston is just enough to balance the tension in the spring, the piston comes to rest in a position that depends on the flow rate.

2.2 METHODS

Each child was weighed with normal light clothing. The purpose and technique of the test was described to the subjects in groups of ten and the method of blowing into the instrument was demonstrated. Each subject then held the instrument and had several trial blows, until it was clear that he/she was using the meter properly and comfortably (this usually required 2-4 blows). Each was encouraged to make a maximal effort and was closely watched to ensure that he/she maintained an airtight seal between the lips and mouth piece of the instrument. Each child blew five times into the flow meter and three maximum readings were recorded.

3 OBSERVATIONS/ RESULTS

The children in 10 – 20 Kgs weight group had a mean PEFR of 192.39 L/Min. with a S.D. of 35.98; the children in 21 – 30 Kgs weight group had a mean PEFR of 294.59 L/Min. with a S.D. of 39.21; the children in 31 – 40 Kgs weight group had a mean PEFR of 359.41 L/Min. with a S.D. of 40.77; the children in 41 – 50 Kgs weight group had a mean PEFR of 421.48 L/Min with a S.D. of 32.28; the children in 51 – 60 Kgs weight group had a mean PEFR of 479.43 L/Min with a S.D. of 26.09 and the children in 61 – 70 Kgs weight group had a mean PEFR of 541.82 L/Min. with a S.D. of 27.24.

4 DISCUSSION

PEFR AND WEIGHT

The minimum and maximum weights of the Boys were 14 and 70 Kgs respectively. The minimum and maximum weights of the Girls were 13 and 56 Kgs respectively. The percentage distribution of the subjects with respect to weight and sex are shown in Table 1.

The mean weight of 268 boys was 35.07 Kgs with a S.D. of 14.64. The mean weight of 227 girls was 30.21 Kgs with a S.D. of 12.34. The mean weight of all the 495 students was 32.84 Kgs with a S.D. of 13.72. The mean weights of the subjects fall within normal limits and are comparable to those included in the study of Malik S.K. et.al.

The mean PEFRs with S.D. , C.V. and S.E.M of all the subjects with respect to weight are shown in Table 3.

The children in 10 – 20 Kgs weight group had a mean PEFR of 192.39 L/Min. with a S.D. of 35.98; the children in 21 – 30 Kgs weight group had a mean PEFR of 294.59 L/Min. with a S.D. of 39.21; the children in 31 – 40 Kgs weight group had a mean PEFR of 359.41 L/Min. with a S.D. of 40.77; the children in 41 – 50 Kgs weight group had a mean PEFR of 421.48 L/Min with a S.D. of 32.28; the children in 51 – 60 Kgs weight group had a mean PEFR of 479.43 L/Min with a S.D. of 26.09 and the children in 61 – 70 Kgs weight group had a mean PEFR of 541.82 L/Min. with a S.D. of 27.24.

The progressive increase in the PEFR values with increasing weight is obvious. PEFR shows good correlation with weight. The relationship is statistically significant as indicated by the correlation coefficient i.e. , r = 0.953 both sexes combined , 0.967 in boys and 0.925 in girls. The P value is less than 0.001 in all the cases. The r values are comparable to those obtained in the studies by Parmar V.R. et.al and Malik S.K. et.al.

From the above discussion , the statistically highly significant relation of PEFR and Weight is evident. Though full efforts have been made to get the subjects best cooperation it is possible that some of the children might not have given their best performance during the test. Also some might not have recalled the previous history of chest illness correctly and might have had subtle grade of asymptomatic small airways obstruction which is not detectable by PEFR test.In addition genetic makeup of the individual which contributes to one third of the phenotypic expression, also influences the performance of the individual.The Co-efficients (r) of PEFR obtained in the present study has been compared with those of other work done in North India and Western Countries. The values in different studies are in close concordance with each other.

Table 1. The percentage distribution of the subjects with respect to Weight and Sex

	Total (n=495)		Boys (n=268)		Girls (n=227)	
Weight (Kgs)	No	%	No	%	No	%
10 - 20	113	22.8	49	18.2	64	28.2
21 - 30	135	27.3	65	24.3	70	30.8
31 - 40	102	20.6	68	25.4	34	15
41 - 50	81	16.4	38	14.2	43	18.9
51 - 60	53	10.7	37	13.8	16	7.1
61 - 70	11	2.2	11	4.1	-	-

Table 2. The mean Weight with S.D. , C.V. & S.E.M of Boys , Girls and all the subjects

Weight (Kgs)	Total (n=495)	Boys (n=268)	Girls (n=227)
Mean	32.84	35.07	30.21
S.D.	13.72	14.64	12.34
C.V.	41.78	41.74	40.85
S.E.M	0.62	0.89	0.82

Table 3. The mean PEFR with S.D. , C.V and S.E.M of All Subjects with respect to Weight

	Total (n = 495)		PEFR (L / Min.)		
Weight (Kgs)	No	Mean	S.D.	C.V %	S.E.M
10 - 20	113	192.39	35.98	18.7	3.38
21 - 30	135	284.59	39.21	13.78	3.37
31 - 40	102	359.41	40.77	11.34	4.04
41 - 50	81	421.48	32.38	7.66	3.59
51 - 60	53	479.43	26.09	5.44	3.58
61 - 70	11	541.82	27.24	5.03	8.21

5 CONCLUSION

PEFRs were measured in a sample of 495 urban school going children from SINDHANUR. This sample comprised of 268 boys and 227 girls in the age group 5-18 years. The mean values of age, height, weight, B.S.A. and PEFR were 11.5 yrs, 140.21 cms , 32.84 Kgs , 1.14 Sq.mts and 328.18 L/min respectively.The correlation of PEFR with Weight was statistically significant. With the detailed statistical analysis and discussion it is quite evident that the present study is statistically highly significant and can be considered as a standard reference for the child population of South India.

The present study has led to the following conclusions :

There is a positive and statistically significant correlation between PEFR and WEIGHT.

Weight has a lesser closer correlation with PEFR than height.

REFERENCES

[1] Dugdale A.E and Moeri.M : Normal values of forced capacity (FVC), Forced expiratory volume (FEV1) and Peak Flow Rate (PFR) in children *Arch.Dis.Child* **1968**, **43:**229

[2] Godfrey S.,Kamburoff P.L. and Nairn J.R. : Study of peak expiratory flow rates on a sample of 382 normal boys and girls using standard Wright peak flow meter. *British Medical Journal of Diseases of Chest* **1970**,**64**:15

[3] Gregg I. and Nunn A.J. : Peak expiratory flow in normal subjects, *British Medical Journal* **1973**, **3** :282

[4] Ian Gregg : The measurement of PEFR and its application in general practice., *J. Col. Gen. pract* **7**, **1964**, 199 and 215

[5] Juhl.B : Pulmonary function investigation in 1011 school children using Wright peak flow meter, *Scand J, Chin Lab. Invest* **1970**, **25**, 355-361

[6] Kashyap.S and Malik S.K. : PEFR of healthy school boys from Himachal Pradesh (North India), *Indian J. Chest Dis and All. Sci*., **1987**, **Vol 29 No 4,** 216-218

[7] Malik S.K., Jindal S.K. and Jindal V : PEFR in healthy adults, *Ind J of Chest Dis*, **1975**, **17** : 166-171
[8] Malik S.K. , Jindal S.K>, Sharda P.K., and Banga N. : PEFR in healthy boys from Punjab, *Indian Paediatric* **1981**, **18**, 517-521
[9] Nairn J.R. , Bennet A.J , Bennet J.D and Mc.Arther .P : A study of respiratory function in normal school children – the peak flow rate , *Archives of diseases in childhood* **1961** , **36** : 253
[10] Parmar V., Kumar L. and Malik S.K. : Normal values of PEFR in healthy North Indian school children 6-16 years of age- *Indian Paed.* **1977**, **14** : 591-594
[11] Prime F.J. : Peak Flow Meter, *B.M.J.* **1960**, **1** :423
[12] Singh H.D. and Meenakshi K. : Expiratory flow rates in boys *Ind J Of Paed.,* **1976**, **43** : 83-87
[13] Tinker C.M. : PEFR as measured by Wright PFM, *B.M.J.,* **1961**, **1**:196
[14] Wright B.M. : a miniature Wright PFM, *B.M.J*., **Dec 1978**, **2**:1627-1628;9
[15] West J.B. : *Best and Taylor's Physiological basis of medical practice* **12 th edi** Williams and Wilkins. **1985**, ps 586-603
[16] Cotes J.E. : Lung Function-assessment and application in medicine **edi 4** *Blackwel scientific Oxford*. Ps **1979**, 89-107,333-340,370-377
[17] Gibson G.J. : Clinical tests of respiratory function, *New York Raven Press*, **1984**