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KEY WORDS:

A STUDY ON PEAK EXPIRATORY FLOW RATE AND ITS CORRELATION WITH ANTHROPOMETRIC VARIABLES AMONG HEALTHY CHILDREN OF JAIPUR

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INTRODUCTION

Respiratory disorders are major group of illnesses affecting children especially in India and is one of the important causes of childhood morbidity and mortality.[1] Pulmonary Function Tests (PFT) are commonly used in order to diagnose respiratory diseases but it is difficult to measure pulmonary functions in small children. PEFR measurement can be done in children above 4-5yrs. of age. Besides this, PEFR does not require a big instrument like other PFT's.

PEFR measurement is simple, reproducible, quantitative and reliable way of judging the degree of airway obstruction in various obstructive pulmonary diseases[2] specially Asthma, and can reveal the diurnal variability of airway of patients who have been suffering from reactive airway disease but not in normal children, that gives the early clue to diagnosis and management. The study was designed to determine PEFR in normal healthy children of Jaipur and correlate it with various socio-demographic variables like age, gender, ethinicity & anthropometric variables like height, body surface area, and waist-hip ratio (WHR), BMI(body mass index), MUAC(mid upper arm circumference)

AIMS AND OBJECTIVES

"A study of prevalence of Peak expiratory flow rate and its correlation with anthropometric variables in normal healthy children of Jaipur" was conducted by the Department of Pediatrics, Mahatma Gandhi Medical College and Hospital Sitapura ,JAIPUR. Study has following aims and objectives:

1) To determine the PEFR in normal healthy children of Jaipur city.
2) To assess the correlation between PEFR & anthropometric variables.
3) To identify the factors affecting PEFR in a normal child.

MATERIALS AND METHODS

Study Design: cross sectional observational study.

Study Place: subject were children of age group (5-15)years, randomly selected from the chosen schools. Study was aimed to assess the peak Expiratory flow rate and its correlation with variables like height, MUAC, BSA, BMI, WHR, Age and Gender.

Inclusion Criteria: All healthy children (5-15) years of age of both sexes.

Exclusion Criteria:

1) Children with history of asthma or cardiovascular problems.
2) Children with present acute or past or present chronic disease of respiratory system.
3) Children with major respiratory disease such as congenital anomalies or thoracic surgery.
4) Children with history of respiratory tract infection in past three weeks.
5) Children with skeletal deformities such as kyphosis/ scoliosis or with musculoskeletal symptoms.
6) Children with severe malnourishment and morbid obesity Sample Size – 540 children

OBSERVATION AND RESULTS

Table 1: Association between Age groups and PEFR

	N	Mean	SD	Minimum	Maximum	P value
5-8	123	150.41	28.926	110	250	<0.001 (S)
9-12	211	239.29	48.015	150	400	
13-15	206	311.70	68.881	180	550	
Total	540	246.67	81.513	110	550	
S-Significant						

Age group 13-15 years showed maximum PEFR mean score (311.70) as compared to 9-12 age years (239.29) and 5-8 age groups (150.41). Comparison of age groups with PEFR showed statistically significant results by using ANOVA test.Table 1 shows tabular presentation of the descriptive statistics of PEFR measured through mini Wright's peak flow meter. The minimum PEFR in the age group 5-8 years was 110 and maximum was 250. The same way, minimum and maximum PEFR in the age group 9-12 years was 150 and 400, and that of 13-15 years, minimum was 180 and maximum was 550.As the age increase, Statistical significant increase in PEFR was found.

Table 2: Association between Gender and PEFR

Gender	N	Mean	Std.	Deviation	Mean differences	P value
M	283	268.53	89.857	45.94		<0.001 (S)
F	257	222.59	63.122			
S-Significant						

Males showed PEFR mean score (268.53) as compared to the females which showed PEFR mean score of 222.59. Comparison of gender with PEFR showed statistically significant results by using ANOVA test. Mean difference of PEFR between male and female was 45.94.The values of PEFR o girls were significantly lower than that of boys.

Table 3: Association between Height and PEFR

Height (cm)	N	Mean	Std. Deviation	Minimum	Maximum	P value
<100	3	120.00	10.000	110	130	<0.001 (S)
101-150	334	208.29	58.885	110	440	
>151	203	311.67	71.358	150	550	

Table 3 show association between height(cm) and PEFR. The number of cases in the children height groups <100cm, 101-150cm and >151cm were 3, 334 and 203respectively for both male and female subjects. Children <100 cm of height showed PEFR mean score of 120 with a SD of 10.000,101-150 cms of height group showed PEFR mean score of 208.29 with a SD of 58.885 and children > 151 cms of height group showed maximum PEFR of 311.67 with a SD of 71.358.Minimum and maximum PEFR in <100cm height was 110 and 130, 101-150cm of height, PEFR was 110 and 440 , >151cm height it was 150 and 550.The p value obtained was <0.001 depicting a statistically significant positive association between Height and PEFR

Table 4: Association between MUAC and PEFR

MUAC	N	Mean	Std. Deviation	Minimum	Maximum	P value
1-10	1	150.00	.	150	150	<0.001 (S)

11-20	351	212.93	63.701	110	440	
21-30	185	309.68	73.319	160	550	
31-40	3	340.00	36.056	300	370	

Table 4 show association between MUAC and PEFR. The cases were divided into 4 ranges of MUAC, cases having MUAC from 1-10cm, 11-20cm, 21-30cm and 31-40cm.The number of cases (N) in each of these ranges were 1,351,185 and 3 respectively for both the male and female age group. The mean PEFR in the 4 MUAC ranges given above was 150,212.93 with a SD of 63.701, 309.68 with a SD of 73.319, 340.00 with a SD of 36.056.The minimum and maximum PEFR in the 1-10 cm MUAC was 150, in 11-20 cm it was 110 and 440, in 21-30 cm it was 160 and 550 and in 31-40 cm it was 300 and 370. The p value obtained was <0.001, showing a statistically significant positive association between MUAC and PEFR.

Table 5: Association between WHR and PEFR

WHR	N	Mean	Std. Deviation	Minimum	Maximum	P value
0.6-0.79	246	256.42	74.964	110	550	0.02 (S)
0.8-1	292	238.15	85.822	110	550	
1.1-1.2	2	290.00	113.137	210	370	

S-Significant

Table 5 show association between WHR and PEFR. The cases were divided into groups of 0.6-0.79, 0.8-1 and 1.1-1.2. The number cases (N) in each of these groups were 246, 292 and 2 respectively both for males and female subjects. The mean PEFR in the three WHR ranges given above were 256.42 with a SD of 74.964, 238.15 with a SD of 85.822, 290.00 with a SD of 113.137. Minimum and maximum PEFR in 0.6-0.79 WHR group was 110 and 550, in 0.8-1 WHR group was 110 and 550, in 1.1-1.2 WHR group was 210 and 370. The p value obtained was 0.02, showing a statistically significant association between WHR and PEFR.(Having excluded malnourished and Obese children)

Table 6: Association between BSA and PEFR

BSA (m2)	N	Mean	Std. Deviation	Minimum	Maximum	P value
<1	199	172.59	40.551	110	260	<0.001 (S)
1.1-1.5	303	279.60	59.000	150	550	
1.51-2	37	372.03	72.077	210	550	
>2.1	1	370.00	.	370	370	

S-Significant

Table 6 show association between BSA and PEFR. BSA was divided into 4 groups, cases having BSA <1, 1.1-1.5, 1.51-2 and lastly >2.1m2. The number of cases (N) in each of these above mentioned group were 199, 303, 37 and 1 respectively in both the male and females subjects. The mean PEFR in these BSA groups were 172.59 with a SD of 40.551, 279.60 with a SD of 59.000, 372.03 with a SD of 72.077, and 370.00. Minimum and maximum PEFR in the above BSA groups were 110 and 260, 150 and 550, 210 and 550 and 370 and 370 respectively. The p value was <0.001 depicting a statistically significant positive association between BSA and PEFR.

Table 7: Association between BMI and PEFR

BMI	N	Mean	Std. Deviation	Minimum	Maximum	P value
<10	4	157.50	33.040	110	180	<0.001 (S)
11-20	501	242.86	80.295	110	550	
21-30	34	309.56	70.843	210	480	
>31	1	370.00	.	370	370	

Table 7 depict association BMI and PEFR. The BMI ranges were upto 10kg/m2,11-20kg/m2,21-30kg/m2,>31kg/m2.The number of cases (N) in these above mentioned BMI ranges were 4, 501, 34, and 1 respectively for both male and female subjects. The mean PEFR in these BMI groups was 157.50 with a SD of 33.040, 242.86 with a SD of 80.295, 309.56 with a SD of 70.843 and 370.00.Minimum and maximum PEFR in the above BMI groups were 110 and 180, 110 and 550, 210 and 280 and 370 respectively. The level of significance obtained was <0.001 showing a statistically significant positive association between BMI and PEFR.(we have excluded malnourished and obese children)

Table 8: Coefficient of correlation between the study variables for the whole sample Study VariableC o e f fi c i e n t correlation 'r'PEFR

Age	0.791	0.000 (S)
Gender	-0.282	0.000 (S)
Height (cms)	0.832	0.000 (S)
MUAC	0.711	0.000 (S)
WHR	-0.016	0.71
BSA	0.812	0.000 (S)
BMI	0.474	0.000 (S)

Table 8: shows the linear positive correlation coefficient (r value) and the level of significance between different anthropometric parameters such as age, gender, height, MUAC,BSA,BMI and PEFR while gender showed negative correlation coefficient. Significant correlation was observed in all anthropometric variables but height correlated with PEFR (0.832, p<0.000) more than any other parameters.The p value obtained was found showing a strong positive statistically significant association with all the anthropometric variables except WHR.

DISCUSSION

The study was done to observe the relation of age, height, gender, BMI, BSA, WHR, MUAC to PEFR in 540 healthy children in Jaipur. All the study variables, showed statistically significant linear correlation to PEFR when evaluated individually. Maximum positive correlation was seen for height, followed by BSA and other variables and the least positive correlation was found with BMI. The coefficient of correlation between height and PEFR was 0.832.In the same way, coefficient of correlation,

1. Between age and PEFR is 0.791
2. Between MUAC and PEFR is 0.711
3. Between BSA and PEFR is 0.812
4. Between BMI and PEFR is 0.474

The correlation is statistically significant (p<0.001) for all study variables. The variability in PEFR in any child is explained by the height to the maximum extent in our study. Our aim was to create the standard values of PEFR in defined area of Jaipur city varying with different geographical, ethnic, racial and environmental differences and,we observed the PEFR in healthy children of different age groups in Jaipur city. Our result showed that there is significant difference in PEFR values in healthy children of Jaipur city from standard charts upto height 163 cm (98-119cm p 0.02, 120-163cm p<0.001).But in the children with the height 164cm or more, their was no significant difference in PEFR values between our study and the standard charts (p value0.2).

SUMMARY

A total of 540 children (5-15 years) were selected randomly to obtain peak expiratory flow rate. The mini Wright's peak flow meter was used to measure peak flow rate in a standard way. The highest of three reading was taken as the correct value. Anthropometric parameters including gender,height, age were recorded and BSA, BMI, MUAC, WHR were calculated.Mean values of PEFR were found to have statistically significant positive correlation with each of the anthropometric variable.So, the age of the individual, gender, height, BMI, MUAC, WHR and BMI play an important role in determining the final response of the lung functions among healthy children. Our main aim was to determine whether the standard values of PEFR in defined area of Jaipur city are different from the already existing standard charts due to geographical, ethnic, racial and environmental differences. So, we observed the PEFR in healthy children of different age groups in Jaipur city.Our result showed that there is significant difference in PEFR values in healthy children of Jaipur city from standard charts upto height 163 cm (98-119cm p 0.02, 120-163cm p<0.001). In the children with the height 164cm or more, their was no significant difference in PEFR values between our study and the standard charts (p value0.2).

CONCLUSION

Correlating Peak Expiratory flow Rate with age, height, gender, BMI, BSA, WHR, MUAC, using data from 540 children among Jaipur city, was the aim successfully achieved in this study. Strong correlation was found between PEFR with all demographic and anthropometric variables but height was found to be highest strongly correlated. The boys had significantly higher values of PEFR than the girls. Findings of this study suggested to prefer height based nomogram to age and other variables nomogram because height correlated best with PEFR. Within India, ethnic, geographical, racial differences have been shown to account for differences in pulmonary function and therefore, it is important to establish reference values for each region. In conclusion, we would also like to reemphasise the value of regular and routine PEFR measurements in asthmatic children in order to monitor their clinical status.We hope, that the reference values we have generated in Jaipur healthy children will be used and the similar data and further more studies on larger scale are needed to establish factors affecting PEFR and to generate regional standardized PEFR charts.