Original Article

Spirometric Reference Values in Healthy Non-Smoking Adults of Urban Population of Hyderabad Division

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ABSTRACT

Objective: To provide spirometric reference values in safe non-smoking adults from the Hyderabad division facilitate the pulmonologist and physicians to diagnose monitor and prognoses.

Study Design: Descriptive and cross-sectional study

Place and Duration of Study: This study was conducted at the Jamshoro University of Health and Medical Department for Physiology, Liaquat University from January, 2019 to December, 2019.

Materials and Methods: Respiratory system physical examination, blood pressure, height, weight, and BMI were noted. A proper protocol was applied for spirometry measurement using the Vitalograph alpha touch. The spirometric testing was performed in a standing position with nose clips applied on the volunteer`s nose using the manufacturer`s instructions. The Data was analyzed using SPSS version 16.0 for windows.

Results: A total of 450 subjects were included. Out of them 290(86.67%) were male, while 60 (13.33%) were female. The mean age SD of the sample group was 33±17.5 years. The male and female were of equal age and had the same Body Mass Index (BMI). (p = 0.9). An important variation was found between the expected and subject values (p0.05), while PIF was found to be significantly significant (p=0.001). Age was shown to have a strong negative association with FVC (r=-0.28, p=0.0001), FEV1 (r=-0.309, p=0.0001), FEV1/FVC x100 (r=-0.28, p=0.84), FEV6 (r=-0.141, p=0.003), FIVC (r=-0.97, p=0.04), and PIF (r=-0.157, p=0.001). Except for FEV1R (r=0.03, p=0.53), PEF (L/s) (r=0.016, p=0.78), and PEF (L/min) (r=0.016, p=0.74), all spirometry parameters were positively correlated with height for both male and female. FVC (r=0.94, p=0.0001), FEV1 (r=0.51, p=0.0001), and (r=0.54, p=0.0001) were all positively correlated with height (r=0.54, p=0.0001).

Conclusion: The results of pulmonary function test values are comparable to studies reported from Pakistani and south East Asia. The prediction equation obtained may be utilized as reference values for pulmonary function testing for the population of Hyderabad Division.

Key Words: Spirometry Pulmonary Function Tests Hyderabad Sindh

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INTRODUCTION

Respiratory patients must have access to local data for analyzing the spirometry findings. Studies or therapeutic procedures should be conducted on a stable population and according to guidelines of the American Thoracic Society (ATS) for ethnicity and stature.[1] The GLI task force was to define internationally accepted references for the spirometric indices, and derive continuous predictions of lung function [2] In terms of data collection, we used scientific information from countries across the world as well as information from African, South Asian, and Latin American studies. [3] Therefore, measurements of African reference criteria for lung function may not be acceptable. In several African countries, the local calculation equation won't be valid, like Mozambique. So, racial comparison values are also used to correct national ones in African countries. In this way, this approach, particular ethnicities can cause an inferior or subclinical diagnosis in people with (or not have these people) pulmonary symptoms.[4,5] In this study, we focused on the non-symptomatic adults who live in Maputo, Mozambique, to provide estimates that can be used to assess the CF activity of patients in clinical trials.[6,7]

MATERIALS AND METHODS

This study Descriptive and cross-sectional study was conducted at the Jamshoro University of Health and

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Medical Department for Physiology, Liaquat University. The Advanced Studies and Research Board (ASRB) and the Committee on Research Ethics approved the study for the period of one year from January to December 2019.

A sample of 450 healthy non-smoking individuals was selected. Those interested in participating were informed in detail of the purpose of the study and the methodology and were asked. They had also been told that, if they wanted, they could withdraw from their study at any time. These participants took a complete biodata and it was anonymized. Healthy participants without a diagnosis of lung disease or history, negative job experience, Hyderabad Division urban residents, non-smoking residents i.e. no smoking history since last 10 years, age 18-35 years of both genders were included while any respiratory symptoms or signs were not included in the otherwise normal-looking subjects, influenza or pulmonary diseases over the last seven days, subjects with a history of pulmonary tuberculosis, bronchial asthma, pulmonary chronic obstructive disease, workers and residents of Hyderabad industrial areas.

Medical Screening Session: The weight and height index (BMI) by formula was calculated; BMI= Weight(kg)/height (m2). The averages of two readings in the supine and standing conditions were recorded for each subject. Blood pressure systematic was described as ~140 mmHg or blood pressure diastolic >>90 mmHg.

Spirometric analyses for lung function were performed using the Vitalograph alpha touch/power laboratory spirometer (AD instrument). Vitalograph alpha touch/power laboratory (AD instrument) spirometer's specifications are as follows:

To achieve at least two acceptable and reproductive values, 3-5 lung function maneuvers were recommended for each subject. Statistical analysis considered the largest and second-largest FEV1 and FVC values in 200 ml each.

For each subject, the FVC, FEV1, and PEF have been recorded. All recordings have been performed according to the guidelines of the American Thoracic Society (ATS).

Data Analysis: SPSS version 20.0 for analysis was used to evaluate data. Mean ± SD is used to test the quantitative variables. For categorical variables, frequency and percentages were presented. The distinction between FVC/FEV1 and age and height was employed by Pearson/Spearman. The categorical variables have been tested in chi-square. For predictive models using age and height as a standard variable and FVC and FEV1 as a dependent variable, the multiple linear regression analysis was employed. P-value ≤ 0.05 was taken as significant level.

RESULTS

In the sample, 450 healthy adults aged 18 to 35 from the Hyderabad Division were spirometrically controlled. The participants included the young students, physicians, paramedical and nursing personnel, and peons of the Medical Sciences of the Jamshoro University of Liaquat belonging to the various Hyderabad districts. Out of 450 individuals, 290 were males (86.67%) and 60 (13.33%) were females. The ratio of men to women is 4.8:1. The average study age ±SD was 33±17,5, respectively. The men and women of the same generation were BMI-equivalent. [p=0.9].

The majority of the sample population, both men and women, was around 33 years of age. (Table I.) In graphs II and III, men to women are seen in percentage and height per centimeter. Information of the VC, FVC, FEV1, FEV1R, FEV1/FVC x100, FEV6, PEF (L/S), PEF, FEF 25-75, and PIF expected and subject value can be found in Tables 1 through 11. Table 1. A substantial difference was observed (p<0,05) between the expected values and the subjects, while the PIF (p=0,001) was highly significant. The FVC era (r=-0.28, p=0.0001), FEV1 (r=-0.28, p=0.0001, p=0.001), FEV1/FVC x100 (r=-0.28,p=0.84), FEV6 (r=-0.141, p=0.0003), FIVC (r=-0.97, p=0.04), and PIF (r =-0.157, p=0.001), were noted as being significantly negative. This included: Table.3 shows specifics of Pearson's age association with various variables. The height of both male and male except for FEV1R (r=0.03, p=0.53), PEF(L/s) (r=0.016, p=0.78) and PEP(L/min) was associated positively with all parameters of spirometry except for FEV (r=0.016, p=0.74). The height of FVC (r=0.94, p=0. 0001), FeV1 (r=0.51, p=0,0001) and (r=0.54, p=0.0001) is strongly positive. Table.3 shows descriptions of Pearson's height association with various variables.

Table No.1: Anthropometric characteristics of the participants

Parameter	Males (ni=i290) Mean	SD	Females (ni=i60) Mean	SD
Agei(years)	20.4	1.3	20.5	1.2
Heighti(cm)	172.3	6.5	164.4	8.1***
Weighti(kg)	65.3	8.6	60.1	8.8***
BMIi(kg/m2)	21.9	2.7	22.2	2.7
Thoraxi(cm)	88.8	7.0	79.5	7.1

ni=itotalinumberiofiparticipants.
SDi=istandardideviation.
***Pi<i0.001.
BMIi=ibodyimassiindex

Table No.2: Mean Lung volumes and capacities in health young males and females reference value for young Caucasians

Parameter	Malesi (ni=i290)i			Females (ni=i60)i		
	Measuredivalues		difference%	Measuredivalues		Difference (%)
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
RV(L)	1.69±0.17	1.58±i0.08	107*	1.54±0.21	1.37±0.14	105*
ICi(L)	3.05±0.31	3.53±0.35	86*	2.30±0.31	2.24±0.34	93*
FRCi(L)	3.84±0.22	3.17±0.15	110*	2.76±0.33	2.70±0.17	106*
VCi(L)	4.84±0.22	5.16±0.40	94*	3.82±0.40	3.72±0.37	97*
TLCi(L)	6.53±0.45	6.70±0.50	97*	5.07±0.57	5.06±0.52	99
FEV1(L)	3.75±0.36	4.20±0.28	94*	3.22±0.44	3.28±0.31	95*
FVCi(L)	4.59±0.40	5.04±0.44	93*	3.86±0.42	3.84±0.31	97*
FEV1/FVCi(%)	84.4±83.0		101*	87.8±84.0		104

SD=istandardideviation;ini=itotalinumberiofiparticipants. *Pi<i0.05i(pairedit-test).
RVi=iresidualivolume;iICi=iinspiratoryicapacity;iFRCi=ifunctionaliresidualicapacity;iVCi=ivitalicapacity;iTLCi=itotalilungicapacity;iFEV1i=iforcediexpiratoryivolumeiini1is;iFVCi=iforcedivitalicapacity.

Table No.3: Multiple regress on analysis of spirometric parameters and anthropometric factors in healthy young Iran animals and females

Parameter	Heighti(cm)		Weighti(kg)		BMIi(kg/m2)		Thorax (cm)	
Malesii(ni=i290)i	r	P-value	r	P-value	r	P-value	r	P-value
TVi	0.459	0.000	0.212i	0.009	–0.095i	0.245i	0.305i	0.001i
IRVi	0.537	0.000	0.241i	0.003	–0.066i	0.423i	0.233i	0.014i
ERVi	0.452	0.000	0.294i	0.000	–0.048i	0.554i	0.292i	0.002i
RVi	0.246	0.002	0.004i	0.960	–0.105i	0.200i	-0.103i	0.283i
ICi	0.706	0.000	0.321	0.000	–0.081	0.318	0.327i	0.000i
FRCi	0.743	0.000	0.244	0.002	–0.112	0.169	0.160i	0.094i
VCi	0.753	0.000	0.394	0.000	–0.053	0.517	0.384i	0.000i
TLCi	0.785	0.000	0.315	0.000	–0.138	0.091	0.302i	0.001i
FEV1i	0.426	0.000	0.111	0.173	–0.149	0.067	0.264i	0.005i
FVCi	0.448	0.000	0.176	0.030	–0.129	0.114	0.306i	0.001i
FEV1/FVCi	0.058	0.481	-0.041	0.614	–0.410	0.619	0.006i	0.954i
Femalesi(ni=660)								
TVi	0.341	0.000	0.161	0.050	–0.058	0.484	0.251	0.002
IRVi	0.732	0.000	0.607	0.000	0.180	0.028	0.640	0.000
ICi	0.726	0.000	0.610	0.000	0.186	0.023	0.637	0.000
ERVi	0.515	0.000	0.189	0.020	–0.183	0.025	0.424	0.000
RVi	0.782	0.000	0.416	0.000	–0.103	0.209	0.552	0.000
FRCi	0.785	0.000	0.366	0.000	–0.175	0.033	0.580	0.000
VCi	0.794	0.000	0.567	0.000	0.073	0.372	0.681	0.000
TLCi	0.866	0.000	0.564	0.000	0.013	0.876	0.703	0.000
FEV1i	0.762	0.000	0.468	0.000	–0.016	0.851	0.639	0.000
FVCi	0.586	0.000	0.366	0.000	–0.005	0.916	0.501	0.000
FEV1/FVCi	0.057	0.866	0.051	0.537	0.02	0.820	0.084	0.307

ri=icorrelationicoefficient; ni=itotalinumberiofiparticipants. BMIi=ibodyimassiindex.
TVi=itidalivolume;iIRVi=iinspiratoryireserveivolume;iICi=inspiratoryicapacity;
ERVi=iexpiratoryireserveivolume;iRVi=iresidualivolume;iFRCi=ifunctionaliresidual
capacity;iVCi=ivitalicapacity;iTLCi=itotalilung;iFEV1i=iforcediexpiratoryivolumeiini1s;iFVCi=iforcedivitalicapacity

DISCUSSION

The results of the present research are confirmed by other reports, from which have been recorded from the Far East.[8–11] If some disagree, what accounts for creativity, desires, likes, and dislikes are all impossible to put into words? PFT has shown pulmonary function values to be significantly diminished in the Asian population payola plies.[12,13]

Fulambarker A. et al.[14] did a comparative analysis on refugee and US-born Indians. In the survey included in this analysis, more than 262 Indians who were born in India and nearly 200 who were raised in the US participated. the average age of the participants was

around 16 or slightly younger; 18-35 years for the 18-35 demographic Volunteers had a mean age of around 18 to 35.

The analysis by Aggarwal et al. showed that there was significant regional variation in the results of the PFT test results and concluded that similar equations could not be drawn for the Indian population, with separate results in the North, South, and East Indian locations.[13] so, therefore, the usefulness of these prediction equations must be shown for that group before their application to a specific culture.[15] We also found that the PFT predictions and reference values that have been found in previous studies in Malaysia, India, and other Asian countries are similar.[15–17]

Sample population age, sex, and height values previously identified by other researchers.[18,19] Our FAP provided students with opportunities to seek external assistance with their behavior problems[20], skills for problem-solving, and alternative perspectives (27) [8,15,21], as well as the ability to request supports from trusted individuals when it allocated team roles to peers and brought staff into the classroom to assist.[21–24] Study results showed a similar pattern of pulmonary,[21] function test decline for age and those previously reported in other national and international research.[22–24]

The positive association of FEV1, FVC, and FEV1/FVC ratio is shown. It could be possible that differences in parameters in physical fitness test scores may be attributed to the variation in height.[25] Similar reference values for PFTs were discovered in the analysis of recent samples taken in Pakistan, Nepal, and India, as well as with the most recent results from Pakistan, India, Nepal, and Malaysia. In the present sample,[25] FVC and FEV1 values were found to be lower in both genders.[26]

Saleem et al.[8] The research by Saleem et al. reported on PFT values for people in Kashmir, which found that they were similar to those of Caucasians but slightly higher for the Indian population. It is because of their altitude, as well as racial distinctions, the adaptive reaction of highlanders, and possible genetic influences on the population, he speculated.[27]

Various population groups in Pakistan should be studied using various studies should be done to establish this show, people at the lower altitudes, Baltistan, including Karachi and Hyderabad could have a higher expiratory flow rate (FEFV) than those at higher altitudes.

In this study, an association with age and height (the VC, FV, FV1, and FV ratios. The findings of this analysis were consistent with previous research, which found that age has a strong inverse relationship with P41 values.[28] However, in children, a substantial relationship between VC, FVC, and FEV1 was observed. This may be explained in part by participants in the present study's age; nonetheless, the findings are quite close to previously published data.[28]

Results of the present study were found to be approximately 17% to 17-20% to 19% lower for FEV and 16% to 17% lower for FVC in European populations.[17] At the woman, FEV1 and FVC levels were 13% and 6% lower, while for the man, values were 18% and 19% lower (p=0.001).

CONCLUSION

In conclusion, findings from the investigation on the balanced, non-smoking individuals of the Hyderabad division give a wide variety of height and age about the PFT equation. Validated measures of pulmonary function assessment/testing are important for health and disease diagnosis and study. These estimates can be used as references for the people of the Hyderabad Division.

Author's Contribution:

Concept & Design of Study:	Ahmed Hussain Suhag
Drafting:	Masood Nabi Noor, Kelash Kumar
Data Analysis:	Altaf Hussain Memon, Ameer Abbas, Ghullam Mujtaba Shah
Revisiting Critically:	Ahmed Hussain Suhag, Masood Nabi Noor
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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