



## ORIGINAL RESEARCH ARTICLE

### PULMONARY FUNCTION TESTS OF MONGOLOID AND NON MONGOLOID GROUP OF DHARAN

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#### ABSTRACT

**Background:** Ethnicity is seen to effect normal reference values and prediction equations of pulmonary function tests (PFTs). The normal reference of PFTs among mongoloid and non mongoloid group of Dharan is not available. The aim of the study was to find out the normal reference values of two groups in Dharan and also to find out the correlation of height, weight and body surface area with different PFT parameters.

**Methods:** This cross-sectional study was conducted among 250 (125 mongoloids and 125 non mongoloids) healthy male subjects. Convenient sampling technique was done. Every 5th patient attendant who was permanent resident of Dharan coming to clinical Physiology lab was selected as subject in each group. Portable PFT machine (CHESTOGRAPH, HI-101 Spirometry system) was used for measurement of our test. The test was conducted according to European Respiratory Society (ERS)/American Thoracic Society (ATS criteria).

**Results:** Independent sample t-test was used to compare means between two groups. There was significantly more height ( $165.30 \pm 8.21$  vs  $161.43 \pm 7.35$ ),  $p < .05$ ], weight [ $(59.29 \pm 11.64$  vs  $55.32 \pm 10.75)$ ,  $p < .05$ ] and body surface area [ $(1.64 \pm 0.172$  vs  $1.57 \pm 0.149)$ ,  $p < .05$ ], in the non-mongoloid group compared to mongoloid group. PFT parameters were also higher in non-mongoloid group VC [ $(3.3982 \pm 0.70725$  Vs  $3.0982 \pm 0.78832)$   $p < .05$ ], FVC [ $(3.2798 \pm 0.74312$  Vs  $2.988 \pm 0.81970)$ ,  $p < .05$ ], and FEV1 [ $(3.0668 \pm 0.72044$  Vs  $2.7861 \pm 0.83061)$   $p < .05$ ]. The prediction equations were also calculated for both groups.

**Conclusions:** There was difference in PFT parameters between two groups. Prediction equations were also different in both groups.

#### INTRODUCTION

Spirometry is a well-known technique for evaluating pulmonary function. It is recommended to use the spirometric reference values derived from subjects who are healthy and with similar ethnic background as patients.<sup>1</sup> An established reference standard for pulmonary function of Dharan population is lacking. Usually in Nepal, the spirometers manufactured in India or west are used. One of the studies has shown that the prediction equations made for Indian adult

females can be used to predict vital capacity of Nepalese adult female.<sup>2</sup> But variability in values of pulmonary function among various racial and ethnic groups is well documented.<sup>1</sup> This difference is contributed by differences in body proportions, chest wall anatomy, mechanical properties of the thorax etc.<sup>3</sup> One of the study done in Rangel of Nepal had reported difference in PFT parameters between mongoloid and non mongoloid groups.<sup>4</sup> Studies have also suggested the effect of developmental adaptation on lung function at high altitude.<sup>5</sup> For the

same reason the PFT parameters in population of Dharan might be different from Rangeli. Hence we conducted a study to find out the reference value of population of Dharan, which can be used as pilot study to take reference for large population. Our objective was to obtain the normal reference values for FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC ratio and PEFr among the healthy population (mongoloid and non mongoloid group) of Dharan attending physiology lab of BPKIHS and also to determine the relationship between different Lung Function parameters with age, height and body surface area.

## METHODS

This cross-sectional study was conducted from March 2015 to March 2016. Two hundred fifty healthy male patient attendants of Dharan coming to Physiology lab of BPKIHS between ages 18 to 30 years were taken as subjects. Permanent residents of Dharan were taken. Convenient sampling technique was done. Every 5<sup>th</sup> male patient attendant coming to Physiology lab was selected in each group. All the procedures were explained to them. The PFT was done after taking written, informed consent. Detailed history was taken and clinical examination was done. After finishing the interview with subject, patients exhibiting objective or subjective manifestations of diabetic neuropathy, history of chronic alcohol use, history of cervical trauma, cerebrovascular or cardiovascular disease and any respiratory dysfunctions were excluded from the study. Those with abnormalities were referred for treatment. After selecting subjects as per our inclusion criteria pulmonary function tests was performed. Subjects Id no, Name and ethnicity (race) was taken. Age was taken in yrs, height in cms and weight in Kgs. Portable PFT machine (CHESTOGRAPH, HI-101 Spirometry system) was used for measurement of our test. The test was carried out with the subject seated and with a nose clip applied. The equipment was calibrated fully every day. VC, FVC and FEV<sub>1</sub>, PEFr, FEV<sub>1</sub>% was measured according to the American Thoracic Society (ATS) criteria.<sup>3</sup>

**Recording procedure:** The nose was clipped, mouth piece was placed in the mouth and asked to breathe at rest for some time. Subject were then asked to inspire slowly to maximum and then

to fully expire with maximum force. Subjects were advised to perform maximum inspiration and maximum expiration and then return to normal respiration. 3 measurements were performed to confirm the reproducibility. The spirometer was computerized and printed result of these parameters was displayed. Ethical clearance was taken from Institutional ethical review board BPKIHS.

**Statistical analysis:** Data analysis was done in SPSS version 23. Among 250 subjects, 125 were non mongoloid group and 125 were mongoloid group. The mean of all anthropometric and PFT parameters were taken. Independent sample t test was done to compare the means of parameters between two groups. Pearson correlation was done to correlate anthropometric parameters with PFT parameters. Regression equation was used to find out the predictive equation of both groups.

## RESULTS

In comparison of the anthropometric and PFT parameters between mongoloid and non mongoloid group, the age was significantly less in non mongoloid group whereas height and body surface area were significantly higher in non mongoloid group. Vital capacity and FVC were also significantly higher in non mongoloid group. No significant differences were seen between FEV<sub>1</sub>% and PEFr parameters (Table:1).

In case of mongoloid group, age was negatively correlated with all the PFT parameters except TV whereas height was positively correlated with all the PFT parameters. BSA was also positively correlated with all parameters except FEV<sub>1</sub>% and weight was positively correlated with all PFT parameters.

In case of non mongoloid group, height was positively correlated with VC, FVC, FEV<sub>1</sub> and PEFr whereas weight was positively correlated with all PFT parameters except FEV<sub>1</sub>% and BSA was positively correlated with all PFT parameters. The age was negatively correlated with VC and FEV<sub>1</sub>

**Table: 1 Comparisons of anthropometric and PFT parameters between mongoloid and non-mongoloid group**

Anthropometric and PFT parameters	Mean (SD) of non Mongoloid group (n=125)	Mean (SD) of Mongoloid group (n=125)	p-value
Age (yrs)	27.22±9.34	31.96±13.02	0.02
Height (cms)	165.30±8.21	161.43±7.35	0
Weight (kgs)	59.29±11.64	55.32±10.75	0.008
BSA(m2/kg)	1.64±.172	1.57±.149	0.001
TV (L)	.6051±.25215	.5492±.25028	0.094
VC (L)	3.3982±.70725	3.0982±.78832	0.003
FVC (L)	3.2798±.74312	2.988±.81970	0.005
FEV1 (L)	3.0668±.72044	2.7861±.83061	0.007
FEV1 %	93.174±5.9157	92.740±6.6749	0.602
PEF (L/s)	6.446±2.5610	5.531±2.5692	0.008

TV-tidal volume, VC- vit al capacity, FVC- forced vital capacity, FEV1-Forced expiratory volume in 1 seconds, PEF- peak expiratory flow rate 25%, PEF 75- peak expiratory flow 75%, L-liter, S- seconds

**Table: 2 Correlation of anthropometric variables with the PFT parameters of mongoloid group**

Anthropometric Variables	TV (L)		VC (L)		FVC (L)		FEV1 (L)		FEV1 %		PEF	
	Correlation coefficient	p-value										
AGE	-0.111	0.258	-.320**	0.001	-.381**	0	-.449**	0	-.651**	0	-.429**	0
HT (cm)	.322**	0.001	.493**	0	.462**	0	.515**	0	.447**	0	.564**	0
WT (kg)	.365**	0	.223*	0.022	.232*	0.017	.211*	0.03	0.09	0.361	.366**	0
BSA(m2/kg)	.424**	0	.434**	0	.410**	0	.380**	0	0.159	0.105	.566**	0

TV-tidal volume, VC- vit al capacity, FVC- forced vital capacity, FEV1-Forced expiratory volume in 1 seconds, PEF- peak expiratory flow rate 25%, PEF 75- peak expiratory flow 75%, L-liter, S- seconds

**Table: 3 Correlation of anthropometric variables with the PFT parameters of non mongoloid group**

Anthropometric Variables	TV (L)		VC (L)		FVC (L)		FEV1 (L)		FEV1 %		PEF	
	Correlation coefficient	p-value										
AGE	-0.023	0.793	-0.18	0.043	-0.17	0.056	-.179*	0.044	-0.084	0.346	-0.095	0.286
HT (cm)	0.152	0.088	.520**	0	.580**	0	.535**	0	-0.013	0.881	.253**	0.004
WT (kg)	.261**	0.003	.429**	0	.450**	0	.389**	0	-0.107	0.229	.369**	0
BSA(m2/kg)	.258**	0.004	.522**	0	.555**	0	.492**	0	-0.087	0.331	.369**	0

TV-tidal volume, VC- vit al capacity, FVC- forced vital capacity, FEV1-Forced expiratory volume in 1 seconds, PEF- peak expiratory flow rate 25%, PEF 75- peak expiratory flow 75%, L-liter, S- seconds.

**Prediction equation for non mongoloid group**

VC= -2.819+.012W+.035H

FVC= -4.379+.011W+.043H

FEV1= -3.872+.008W+.041H

PEF25%=-.148+.075W+.012H

PEF75%=-3.795+.045H

**Prediction equation for mongoloid group**

VC=-3.806-.012A+.002W+.044H

FVC=-2.977-.017A+.005W+.039H

FEV1=-3.978-.021A+.001W+.046H

## DISCUSSION

The study was conducted on permanent residents of Dharan with the objective to obtain the normal reference values of PFTs among the healthy population of Dharan and also to determine the relationship between different Lung Function parameters with age, height, body weight with mongoloid and non mongoloid group of Dharan. The test was done in accordance with ATS/ERS criteria.<sup>3</sup> During the analysis, it was seen that height, body surface area, VC and FVC were significantly higher in non mongoloid group. The difference in PFT parameters between groups might be because of variation in anthropometric measurements. This is similar to one of the studies done in Rangeli of Nepal which also shows that the PFT parameters between two groups are different.<sup>4</sup> This indicates that different reference and prediction equations should be used while analyzing the reports of both groups. Age was negatively correlated with almost all PFT parameters in mongoloid group but in non mongoloid group, it was negatively correlated only with vital capacity and FEV1. It is similar to one study which states that age is predictor of vital capacity and vital capacity changes with age.<sup>6</sup> The age was also seen to affect the prediction equation.<sup>7</sup> Height, weight and body weight were positively correlated with PFT parameters in both groups. This is also supported by the study which explains FEV1-height relation during pubertal growth. It showed the lung volume changed with height.<sup>8</sup> The prediction equations for both groups were also calculated. This shows that the reference values and prediction equations of both groups are different.

This was a small study done only between mongoloid and non-mongoloid group in males. Large sample size should be taken among different ethnic groups of Nepal and normal reference and prediction equation should be set for all.

## CONCLUSION

The normal PFT parameters between two groups were different. The values of PFT parameters showed decreasing pattern with age and increasing trend with height, weight and BSA in both groups. The prediction equations were also different between groups.

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