

Pulmonary function studies in healthy Filipino adults residing in the United States

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Background: Differences in lung volumes among various ethnic groups are known to occur; however, this has not been studied in Filipinos.

Objective: We sought to assess pulmonary function in healthy, nonsmoking Filipinos residing in the United States compared with standards for white subjects.

Methods: Healthy adult Filipinos, age 18 years or greater, were recruited. All subjects were screened with health questionnaires to exclude those with cardiopulmonary disease. Pulmonary function tests were performed by using forced expiratory maneuvers. Values for FEV₁, forced vital capacity (FVC), FEV₁/FVC, forced expiratory flow from 25% to 75% of FVC, and peak expiratory flow rate were compared with predicted values for white subjects (ie, without a racial adjustment).

Results: Two hundred twenty-four healthy subjects (121 men and 103 women) completed the study. The group means (as a percentage of the predicted standard for white subjects) were as follows: FEV₁, 86%; FVC, 84%; FEV₁/FVC, 103%; forced expiratory flow from 25% to 75% of FVC, 96%; and peak expiratory flow rate, 107%. These findings are very similar to those for African Americans and other Asians.

Conclusion: We conclude that it is appropriate to use an 85% racial adjustment for FEV₁ and FVC when interpreting pulmonary function test results in Filipinos. (*J Allergy Clin Immunol* 1999;104:338-40.)

Key words: Spirometry, pulmonary function, forced expiratory volume, forced vital capacity, racial differences, Filipino

Pulmonary function testing (spirometry) has been widely used as an objective measure to diagnose respiratory disease and to assess the severity and monitor the course of therapy in such disease. Normal spirometric values for white males and females have been well established.¹⁻³ These values have been shown to vary according to age, height, and sex. Mathematical equations have been developed to generate normal predicted values for a given subject on the basis of these parameters.¹⁻³ Pul-

Abbreviations used

FEF ₂₅₋₇₅ :	Forced expiratory flow from 25% to 75% of forced vital capacity
FEV ₁ :	Forced expiratory volume in 1 second
FVC:	Forced vital capacity
PEFR:	Peak expiratory flow rate

monary function values have also been shown to vary according to race or ethnicity.⁴⁻¹³ For example, normal lung volumes for a given age, height, and sex are lower for African Americans compared with white subjects.⁴⁻⁶ Therefore when performing spirometry in African Americans, a racial adjustment or correction factor to the standard for white subjects is often used.^{4,14}

Normal spirometric values for Filipinos have not been previously reported. Knowing whether to apply a racial adjustment in this ethnic group is critical to the correct interpretation of pulmonary function studies. The objective of this study is to determine whether some racial correction factor should be applied when assessing lung function in Filipinos.

METHODS

Adult (age, 18 years or greater) nonsmokers from bilateral Filipino ancestry were recruited. Nonsmoker is defined as total smoking of less than 0.5 pack-years and no smoking within 6 months of the study. All subjects were screened by means of health questionnaires to exclude cardiopulmonary disease or other disease that might be expected to affect pulmonary function. Specifically, to be eligible subjects stated that they had never had the following: asthma, chronic bronchitis, emphysema, tuberculosis, lung cancer, pneumonia, chronic cough, hemoptysis, persistent shortness of breath or wheezing, heart disease, heart attack, heart failure, chest deformity, or chest operation. The subject's height was measured without shoes and rounded to the nearest inch. Weight and blood pressure were measured, and subjects with gross obesity and hypertension were excluded. All tests were done in the standing position. A single portable spirometer (Cybermedic, Louisville, Colo) was used for testing throughout the study. The machine was calibrated daily.

Spirometry was performed according to guidelines provided by the American Thoracic Society.¹⁵ Subjects were instructed in the forced expiratory maneuver and demonstrated appropriate technique. A minimum of 3 acceptable forced expiratory maneuvers was performed. Mean values ($\pm$ SD) were calculated for percent predicted of FEV₁, forced vital capacity (FVC), FEV₁/FVC, forced expiratory flow from 25% to 75% of FVC (FEF₂₅₋₇₅), and peak expiratory flow rate (PEFR) on the basis of standards for white subjects.² This study was approved by the institutional review board of the Naval Medical Center, San Diego, and all subjects provided written informed consent.

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TABLE I. Spirometric values in 224 healthy Filipino adults compared with standards for white subjects

Sex	Age range (y)	n	Average age (y)	Average height (in)	FVC (L), % of predicted value	FEV ₁ (L), % of predicted value	FEV ₁ /FVC (%), % of predicted value	FEF ₂₅₋₇₅ (L/s), % of predicted value	PEFR (L/s), % of predicted value
Men	18-24	26	21 ± 2	65 ± 3	88 ± 14	89 ± 12	103 ± 7	95 ± 21	108 ± 13
	25-34	41	30 ± 3	66 ± 2	84 ± 11	86 ± 10	103 ± 5	98 ± 20	103 ± 17
	35-44	38	39 ± 3	66 ± 2	86 ± 9	87 ± 9	102 ± 6	93 ± 22	111 ± 14
	45-54	11	48 ± 2	65 ± 2	79 ± 9	83 ± 8	106 ± 6	100 ± 28	107 ± 21
	≥55	5	64 ± 6	65 ± 2	82 ± 14	83 ± 7	103 ± 10	90 ± 31	106 ± 19
	All men	121	34 ± 11	66 ± 2	85 ± 11	86 ± 10	103 ± 6	96 ± 22	107 ± 16
Women	18-24	9	20 ± 2	61 ± 2	85 ± 13	88 ± 13	103 ± 4	98 ± 17	111 ± 20
	25-34	23	31 ± 3	61 ± 2	88 ± 11	88 ± 9	100 ± 5	89 ± 15	106 ± 32
	35-44	36	40 ± 3	61 ± 2	84 ± 11	86 ± 11	103 ± 4	99 ± 21	115 ± 26
	45-54	21	48 ± 3	60 ± 1	83 ± 13	84 ± 10	102 ± 6	92 ± 22	103 ± 21
	≥55	14	60 ± 5	61 ± 3	81 ± 13	87 ± 17	108 ± 6	113 ± 43	97 ± 18
	All women	103	41 ± 12	61 ± 2	84 ± 12	86 ± 11	103 ± 5	97 ± 25	106 ± 27
	All subjects	224	37 ± 12	63 ± 3	84 ± 11	86 ± 10	103 ± 6	96 ± 23	107 ± 22

All values are means ± SD.

RESULTS

A total of 224 healthy, nonsmoking Filipinos (age range, 18 to 71 years; 121 men and 103 women) performed acceptable forced expiratory maneuvers. The age distribution and average heights of subjects, along with their spirometric results (as a percentage of predicted value on the basis of standards for white subjects), are shown in Table I.

DISCUSSION

There are known to be differences in normal lung volumes among various ethnic or racial groups. For example, lung volumes (FVC and FEV₁) are about 12% lower in black subjects compared with white subjects.⁴⁻⁶ Similarly, normal values for several Asian populations have been shown to be lower than those for white subjects. Ventilatory studies of Chinese,⁷⁻⁹ Japanese,^{10,11} Indian,⁹ Malaysian,^{9,12} and Micronesian¹³ subjects found that their FEV₁ and FVC values, standardized for age, height, and sex, are approximately 10% to 15% lower than those for white subjects. In contrast, studies of American Indians¹⁶ and Hispanic Americans¹⁷ have shown those groups to have pulmonary function test values similar to those for white subjects. Various explanations, such as body habitus, have been proposed for these differences, but race or ethnicity itself seems to be the determinant factor.⁵

It is essential, when assessing lung function in a given ethnic group, to use appropriate predicted normal values for that ethnic group. Otherwise, normal lung function studies may be interpreted as abnormal, leading to unnecessary further diagnostic investigation and inappropriate treatment. The most common practice when attempting to adjust for racial or ethnic differences in pulmonary function is to apply some correction factor to predicted values for white subjects. This practice is incorrect and may lead to errors,⁶ but it is typically the only

available remedy when using computer software that contains only reference standards for white subjects.¹⁴ Thus as a practical matter, when studying a patient of a given ethnicity, practitioners need to know whether to apply a racial correction factor, as well as the magnitude of such a factor.

No previous study has evaluated normal lung function in Filipinos. On the basis of this study, lung volumes (FVC and FEV₁) in healthy Filipinos are seen to be about 15% lower than established values for white subjects. These same relatively lower lung volumes were found for men and women. Although some variation was seen among age groups, there was no obvious pattern to this variation. Some of the age group variation may well be due to the small number of subjects in some of the age groups, and attributing precise values to a given age group would require caution.

As with other studies of ethnic or racial differences in lung function,^{4,6,10,12} values for FEV₁/FVC were found to be nearly the same as would be predicted for white subjects. This reflects the fact that FEV₁ and FVC are lower compared with standards for white subjects but are lower to the same degree, such that this ratio remains unaffected. Similarly, FEF₂₅₋₇₅ represents a ratio relative to FVC and would likewise be unaffected by a proportional reduction. PEFR was also found to be the same (or perhaps even increased) relative to standards for white subjects, indicating that the relatively lower lung volumes in Filipinos do not affect the initial generation of flow as part of a forced expiratory maneuver.

In summary, when performing pulmonary function testing in Filipinos, we believe it is appropriate to apply an 85% racial adjustment (ie, correction factor of 0.85) to the standards for white subjects for FVC and FEV₁.

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