

Predicted Equations for Ventilatory Function Among Kuching (Sarawak, Malaysia) Population

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SUMMARY

Spirometry data of 869 individuals (males and females) between the ages of 10 to 60 years were analyzed. The analysis yielded the following conclusions:

1. The pattern of Forced Vital Capacity (FVC) and Forced Expiratory Volume in One Second (FEV₁) for the selected subgroups seems to be gender dependant: in males, the highest values were seen in the Chinese, followed by the Malay, and then the Dayak; in females, the highest values were seen in the Chinese, followed by the Dayak, and then the Malay.
2. Smoking that did not produce respiratory symptom was not associated with a decline in lung function, in fact we noted higher values in smokers as compared to nonsmokers.
3. Prediction formulae (54 in total) are worked out for FVC & FEV₁ for the respective gender and each of the selected subgroups.

KEY WORDS:

Spirometry Malays, Chinese, Dayaks, Predicted Equations

INTRODUCTION

Ethnic differences in pulmonary functions are recognized in adults and children^{1,2} and information related to it and their predicted formulas are available for Asians,²⁻¹² Americans,¹³ Europeans¹⁴⁻¹⁶ and Africans^{17,18}. However, there are no available prediction formulae values for lung functions of the various ethnic groups in Sarawak. Predicted values of pulmonary functions are based on many parameters, which include racial/ethnicity,¹⁹⁻²¹ age, gender, body development,²² and other physiological conditions. Despite these, many lung function laboratories fail to provide race specific reference values²³. This is a cause for concern as the use of nonspecific prediction equations can lead to inaccurate interpretation of lung function^{24,25}.

Hence, the aim of this study is to determine the normal values of lung function i.e., Forced Vital Capacity (FVC) and Forced Expiratory Volume in One Second (FEV₁) of the population in Kuching (Sarawak, Malaysia). For that purpose, a cross-sectional epidemiological survey was done in the schools, university campus, police camp, offices, villages, mosque, and various workplaces.

MATERIALS AND METHODS

Subjects were recruited on a voluntary basis from individuals in Kuching (age ranging from 10 to 60 years). The study design was approved by the Ethics Committee of the Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak.

After consents were obtained, recruited subjects were invited to fill in questionnaires, which included questions taken from ATS-DLD-78 questionnaire on respiratory symptoms²⁶. Subjects' standing height was measured (without shoes on) and height recorded to the nearest centimeter with a stadiometer. Subjects' weight was taken (in light clothing and without shoes on) on a balance scale and weight was recorded to the nearest kg. Age was recorded to the nearest birthday in years.

Measurement of Lung Function

The spirometer used in this study is a Schiller Spirovit SP-1, a flow-detecting device (pneumotachograph) that fulfilled the standardization set by the American Thoracic Society²⁷. The spirometer was calibrated in the morning before recording was made. After the nose-clip and mouthpiece was fitted, the subject/participant was urged to inhale deeply, and then to exhale through the mouthpiece as forcefully and completely, and as fast as possible. All the participants were guided through a minimum of three maneuvers of forced spirometry in standing position.

Analysis

Participants who had cough, phlegm, wheeze, and breathlessness and with value of FEV₁ less than 60% of FVC were excluded from analysis. In the younger age group, ventilatory function was observed to increase with increase in age. Expired airflow velocity increases steeply during growth, with peak reach between 20-25 years of age in male and 18-21 years of age in female. The peak value for FEV₁ is in the 20-23 years old, while the peak value for FVC is in the 25 years old. Thereafter, a steady decline in value was seen with increase in age,^{28,29}; for FEV₁, the annual loss is 28-30 mL/year³⁰.

As gender was among the reference variables and affected significantly the standard values, data analysis was done separately on the male and female. Also, as ventilatory function is affected by age, separate analysis was decided for each of the four age groups (divided by years of age): 10-19, 20-24, 25-44, and 45-60 for the male; 10-17, 18-22, 23-44 and 45-65 for the female. Each of the groups was further subdivided into two subgroups based on their smoking habit: smoker and nonsmoker.

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