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Assessment of Small Airway Obstruction in Apparently Healthy Young Adults: Analytical Cross-Sectional Study

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Background: Small airway obstruction is an early indicator of chronic lung diseases, though its presence and prevalence in asymptomatic young adults remain largely unknown.

Objective: To detect small airway obstruction in apparently healthy young adults using impulse oscillometry (IOS) and spirometry.

Methods: An analytical cross-sectional study was conducted in July 2025 among medical undergraduates of Rajarata University of Sri Lanka aged 24 to 27. Minimal sample size was calculated using a prevalence of 10%, a margin of error of 0.05, and a 10% rate. Medical history, physical examination, 6-minute walk test, and contraindications to lung function testing were used to determine eligible clinically-healthy participants. Spirometry and IOS were performed per American Thoracic Society and European Respiratory Society guidelines. In spirometry, forced expiratory volume in the first second (FEV₁) and forced vital capacity (FVC), maximum forced expiratory (MEF), and in IOS, reactance(X) and resistance(R) at frequencies from 5 Hz to 20 Hz (R₅, R₁₀, R₂₀, X₅) were measured. R₅, R₂₀, and R₅-R₂₀ indicate total, central, and peripheral airway resistance, respectively. Spirometry with bronchodilator reversibility was performed when FEV₁: FVC<0.7.

Results: The study sample consisted of 116 participants, aged 24 to 27 years. Pre-bronchodilator reduced FEV₁ was detected in 17(14.7%) and reduced FEV₁: FVC in 2(1.7%) participants. Reduced MEF₂₅ and MEF₅₀ was observed in 61(52.5%) and 47(40.5%), respectively. An elevated R₅-R₂₀(>0.07 kPa.s.L⁻¹) was observed in 40 participants (34.5%, 95%CI 4.8-15.9), indicative of increased peripheral airway resistance. An abnormally reduced X₅ (less than -0.15 kPa.s.L⁻¹), indicative of reduced peripheral airway reactance, was identified in 12 participants (10.3%, 95%CI 4.8-15.9), and an increased Fres of more than 150% of the predicted value in 22 participants (18.9%, 95%CI 11.8-26.1), which is indicative of airway dysfunction.

Conclusion: Subclinical airway obstruction is identifiable in young, apparently healthy individuals with spirometry and IOS, warranting further investigation.

Keywords: Impulse Oscillometry, Spirometry, Small airway obstruction