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ORIGINAL ARTICLE

Prediction equations for spirometry in four- to six-year-old children☆

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Spirometry children;
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Abstract
Objective: To generate prediction equations for spirometry in 4- to 6-year-old children.
Methods: Forced vital capacity, forced expiratory volume in 0.5 s, forced expiratory volume in one second, peak expiratory flow, and forced expiratory flow at 25–75% of the forced vital capacity were assessed in 195 healthy children residing in the town of Sete Lagoas, state of Minas Gerais, Southeastern Brazil. The least mean squares method was used to derive the prediction equations. The level of significance was established as $p < 0.05$.
Results: Overall, 85% of the children succeeded in performing the spirometric maneuvers. In the prediction equation, height was the single predictor of the spirometric variables as follows: forced vital capacity = exponential [(−2.255) + (0.022 × height)], forced expiratory volume in 0.5 s = exponential [(−2.288) + (0.019 × height)], forced expiratory volume in one second = exponential [(−2.767) + (0.026 × height)], peak expiratory flow = exponential

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[(−2.908) + (0.019 × height)], and forced expiratory flow at 25–75% of the forced vital capacity = exponential [(−1.404) + (0.016 × height)]. Neither age nor weight influenced the regression equations. No significant differences in the predicted values for boys and girls were observed. *Conclusion:* The predicted values obtained in the present study are comparable to those reported for preschoolers from both Brazil and other countries.

PALAVRAS-CHAVE
Espirometria infantil;
Criança;
Equações de predição;
Controle de qualidade;
Pré-escola;
Equipamentos

Equações de predição da espirometria em crianças de quatro a seis anos

Resumo

Objetivo: Gerar equações de predição da espirometria em crianças de quatro a seis anos.
Métodos: Capacidade vital forçada, volume expiratório forçado em 0,5 segundo, volume expiratório forçado em 1 segundo, pico de fluxo expiratório e fluxo expiratório forçado com 25-75% da capacidade vital forçada foram avaliados em 195 crianças saudáveis que residem na cidade de Sete Lagoas, Estado de Minas Gerais, Sudeste do Brasil. O método dos mínimos quadrados foi usado para derivar as equações de predição. O nível de significância foi estabelecido como $p < 0,05$.
Resultados: No geral, 85% das crianças foram bem-sucedidas ao fazer as manobras espirométricas. Na equação de predição, a estatura foi a única variável preditora das variáveis espirométricas, da seguinte forma: capacidade vital forçada = exponencial [(-2,255) + (0,022 x estatura)], volume expiratório forçado em 0,5 segundo = exponencial [(-2,288) + (0,019 x estatura)], volume expiratório forçado em 1 segundo = exponencial [(-2,767) + (0,026 x estatura)], pico do fluxo expiratório = exponencial [(-2,908) + (0,019 x estatura)] e fluxo expiratório forçado com 25-75% da capacidade vital forçada = exponencial [(-1,404) + (0,016 x estatura)]. Nem a idade nem o peso influenciaram as equações de regressão. Não foi observada diferença significativa nos valores previstos em meninos e meninas.
Conclusão: Os valores previstos obtidos neste estudo são comparáveis àqueles relatados em crianças em idade pré-escolar tanto do Brasil quanto de outros países.

Introduction

Pulmonary function tests supplement the clinical histories and physical examinations of individuals with respiratory problems and contribute to the diagnosis, prognosis, and monitoring of respiratory diseases, as well as assessments of the therapeutic effects of interventions.[1]

Spirometry is a universally accepted method for assessing pulmonary function, including lung volumes and flows, and is the most widely used method for detecting functional alterations in the pulmonary functions of adults, adolescents, and schoolchildren.[1,2] However, spirometry has not yet been widely studied in Latin American or Brazilian preschool populations.[1,3]

The earliest studies that assessed spirometric maneuvers in preschoolers were published approximately 20 years ago.[4,5] Currently, it is well established in the literature that 75–86% of preschoolers are able to acceptably and reproducibly perform spirometric maneuvers[1,3,6–10] as evidenced by the availability of prediction equations for preschoolers from several countries.[6,8,9,11–17] Additionally, a recent multicenter study[16] proposed prediction equations for spirometric variables from preschoolers based on data collected from the children from 11 different countries ($n = 3777$), including Brazil. An update was published in 2012 and included new multi-ethnic equations.[18] Recently, Burity et al.[19] described reference values based on 135 northeastern Brazilian preschoolers and identified height and sex as predictors of lung function parameters. However, these equations are not necessarily representative of the entire population of Brazilian preschoolers.

Due to the importance of spirometry in all age groups and the scarcity of prediction equations for spirometric variables for preschoolers in Brazil, the present study aimed to describe the prediction equations for spirometry in 4- to 6-year-old children residing in the town of Sete Lagoas, state of Minas Gerais, southeastern Brazil.

Methods

Setting and sampling

The subjects were recruited at randomly selected public and private schools in the town of Sete Lagoas according to the following inclusion criteria: age between 4 and 6 years (*i.e.*, 48–83 months old); no chronic respiratory disease according to the American Thoracic Society and Division of Lung