



Jornal de  
**Pediatria**

www.jpmed.com.br



## ORIGINAL ARTICLE

# Spirometry and volumetric capnography in lung function assessment of obese and normal-weight individuals without asthma<sup>☆</sup>

Q1 Mariana S. Ferreira<sup>a,\*</sup>, Roberto T. Mendes<sup>a</sup>, Fernando A.L. Marson<sup>a,b</sup>,  
Mariana P. Zambon<sup>a</sup>, Maria A.R.G.M. Antonio<sup>a</sup>, Ilma A. Paschoal<sup>c</sup>,  
Adyléia A.D.C. Toro<sup>a</sup>, Silvana D. Severino<sup>a</sup>, Maria A.G.O. Ribeiro<sup>a</sup>, José D. Ribeiro<sup>a</sup>

<sup>a</sup> Universidade Estadual de Campinas (UNICAMP), Faculdade de Ciências Médicas, Departamento de Pediatria, Campinas, SP, Brazil

<sup>b</sup> Universidade Estadual de Campinas (UNICAMP), Faculdade de Ciências Médicas, Departamento de Genética Médica, Campinas, SP, Brazil

<sup>c</sup> Universidade Estadual de Campinas (UNICAMP), Faculdade de Ciências Médicas, Departamento de Clínica Médica, Campinas, SP, Brazil

Received 22 June 2016; accepted 4 October 2016

### KEYWORDS

Capnography;  
Spirometry;  
Obesity

### Abstract

**Objective:** To analyze and compare lung function of obese and healthy, normal-weight children and adolescents, without asthma, through spirometry and volumetric capnography.

**Methods:** Cross-sectional study including 77 subjects (38 obese) aged 5–17 years. All subjects underwent spirometry and volumetric capnography. The evaluations were repeated in obese subjects after the use of a bronchodilator.

**Results:** At the spirometry assessment, obese individuals, when compared with the control group, showed lower values of forced expiratory volume in the first second by forced vital capacity (FEV<sub>1</sub>/FVC) and expiratory flows at 75% and between 25 and 75% of the FVC ( $p < 0.05$ ). Volumetric capnography showed that obese individuals had a higher volume of produced carbon dioxide and alveolar tidal volume ( $p < 0.05$ ). Additionally, the associations between dead space volume and tidal volume, as well as phase-3 slope normalized by tidal volume, were lower in healthy subjects ( $p < 0.05$ ). These data suggest that obesity does not alter ventilation homogeneity, but flow homogeneity. After subdividing the groups by age, a greater difference in lung function was observed in obese and healthy individuals aged >11 years ( $p < 0.05$ ).

<sup>☆</sup> Please cite this article as: Ferreira MS, Mendes RT, Marson FA, Zambon MP, Antonio MA, Paschoal IA, et al. Spirometry and volumetric capnography in lung function assessment of obese and normal-weight individuals without asthma. J Pediatr (Rio J). 2017. <http://dx.doi.org/10.1016/j.jpmed.2016.10.007>

\* Corresponding author.

E-mail: [mariana-simoes@uol.com.br](mailto:mariana-simoes@uol.com.br) (M.S. Ferreira).

<http://dx.doi.org/10.1016/j.jpmed.2016.10.007>

0021-7557/© 2017 Sociedade Brasileira de Pediatria. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

29  
30  
31  
32  
33  
34  
35  
3637  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63**PALAVRAS-CHAVE**Capnografia;  
Espirometria;  
Obesidade

**Conclusion:** Even without the diagnosis of asthma by clinical criteria and without response to bronchodilator use, obese individuals showed lower FEV<sub>1</sub>/FVC values and forced expiratory flow, indicating the presence of an obstructive process. Volumetric capnography showed that obese individuals had higher alveolar tidal volume, with no alterations in ventilation homogeneity, suggesting flow alterations, without affecting lung volumes.

© 2017 Sociedade Brasileira de Pediatria. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Espirometria e capnografia volumétrica na avaliação da função pulmonar de indivíduos obesos e eutróficos sem asma

#### Resumo

**Objetivo:** Analisar e comparar a função pulmonar de crianças e adolescentes obesos e eutróficos saudáveis, sem asma, pela espirometria e capnografia volumétrica.

**Métodos:** Estudo transversal incluindo 77 indivíduos (38 obesos) com idade entre cinco a 17 anos. Todos os indivíduos realizaram espirometria e capnografia volumétrica. Os obesos repetiram as avaliações após o uso de broncodilatador.

**Resultados:** Na avaliação da espirometria, os indivíduos obesos, quando comparados ao grupo controle, apresentaram menores valores no volume expiratório forçado no primeiro segundo pela capacidade vital forçada (VEF<sub>1</sub>/CVF) e nos fluxos expiratórios a 75% da CVF e entre 25-75% da mesma ( $p < 0,05$ ). A capnografia volumétrica demonstrou que os obesos apresentaram maior volume produzido de dióxido de carbono e volume corrente alveolar ( $p < 0,05$ ). Além disso, a relação entre o volume espaço morto e volume corrente, bem como o slope da fase 3 normalizado pelo volume corrente foram menores nos indivíduos saudáveis ( $p < 0,05$ ). Esses dados sugerem que a obesidade não altera a homogeneidade da ventilação, mas sim dos fluxos. Ao subdividir os grupos por idade, foi observada maior diferença na função pulmonar entre indivíduos obesos e saudáveis na faixa etária acima de 11 anos ( $p < 0,05$ ).

**Conclusão:** Mesmo sem o diagnóstico de asma por critérios clínicos e sem resposta ao uso de broncodilatador, os indivíduos obesos apresentaram menores valores no VEF<sub>1</sub>/CVF e nos fluxos expiratórios forçados, indicando a presença de processo obstrutivo. A capnografia volumétrica indicou nos indivíduos obesos maior volume corrente alveolar, sem alterações na homogeneidade da ventilação, sugerindo alteração nos fluxos, sem comprometimento dos volumes pulmonares.

© 2017 Sociedade Brasileira de Pediatria. Publicado por Elsevier Editora Ltda. Este é um artigo Open Access sob uma licença CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Childhood and adolescent obesity has currently reached epidemic proportions and is considered one of the greatest challenges for public health in the 21st century.<sup>1</sup> Considering this rising prevalence, there is a special concern, as dysfunctions resulting from excess fat mass show an increasingly earlier onset, which affect the well-being of these individuals since childhood.<sup>2,3</sup>

One of the deleterious effects of obesity is lung function impairment. Among obese individuals in adulthood, this impairment is already evident in literature.<sup>4-7</sup> It is known that the deposition of adipose tissue on the rib cage leads to an impairment in its compliance and, consequently, to the decrease in its expandability. The mechanical impairment triggers changes in the lung elastic properties, resulting in reduced functional residual capacity, tidal volume (TV), and expiratory reserve volume (ERV). Additionally, there is a reduction in forced vital capacity (FVC) and, consequently, of the total lung capacity.<sup>4-7</sup>

However, the mechanism through which obesity impairs lung function appears to be different in the young population. The results shown in the literature are divergent in relation to the lung function of obese children and adolescents. Discrepancies regarding findings might be influenced by changes in body structure during this period. Moreover, studies include different age and ethnic groups.<sup>8-15</sup>

Spirometry is the most used tool for the analysis of lung function. Its use has been described in increasingly younger populations.<sup>16</sup> However, it is an effort-dependent test that requires understanding and cooperation of the assessed individual, which can generate difficulties in younger subjects. Therefore, the search for new evaluation methods that can be used in this population has been encouraged.

In this context, volumetric capnography (VC) has emerged as an alternative tool for the detection of lung dysfunctions. It is a simple and inexpensive test that does not use inert gases, as it analyzes the carbon dioxide (CO<sub>2</sub>) produced by the lungs. The test consists in analyzing CO<sub>2</sub> as a function of the exhaled TV, and the exhalation pattern

83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100  
101  
102

Download English Version:

<https://daneshyari.com/en/article/8809794>

Download Persian Version:

<https://daneshyari.com/article/8809794>

[Daneshyari.com](https://daneshyari.com)