



ORIGINAL ARTICLE

Fecal microbiota analysis of children with small intestinal bacterial overgrowth among residents of an urban slum in Brazil[☆]

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KEYWORDS

Fecal microbiota;
Environmental exposure;
Child

Abstract

Objective: To analyze the fecal microbiota composition of children living in an urban slum in Brazil, with or without small intestinal bacterial overgrowth, and to investigate the occurrence of stunting and anemia.

Methods: A total of 100 children were studied, aged 5–11 years, from the municipality of Osasco, São Paulo. Small intestinal bacterial overgrowth was screened through hydrogen and methane breath test with lactulose. Weight and height were measured, and the height-for-age and body mass-for-age anthropometric indexes were calculated. The occurrence of anemia was investigated by capillary hemoglobin. Analysis of bacterial phylum, genus, and species was performed by real-time polymerase chain reaction in fecal samples.

Results: Small intestinal bacterial overgrowth was identified in 61.0% of the children. A lower mean of height-for-age Z-score ($[-0.48 \pm 0.90]$ vs. $[-0.11 \pm 0.97]$; $p = 0.027$), as well as capillary hemoglobin ($[12.61 \pm 1.03 \text{ g/dL}]$ vs. $[13.44 \pm 1.19 \text{ g/dL}]$; $p < 0.001$) was demonstrated in children with SIBO when compared with children without small intestinal bacterial overgrowth. Children with small intestinal bacterial overgrowth presented a higher frequency of *Salmonella* spp., when compared to those without small intestinal bacterial overgrowth (37.7% vs. 10.3%; $p = 0.002$). Higher counts of total Eubacteria ($p = 0.014$) and Firmicutes ($p = 0.038$) were observed in children without small intestinal bacterial overgrowth; however, a higher count of *Salmonella* ($p = 0.002$) was found in children with small intestinal bacterial overgrowth.

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PALAVRAS-CHAVE

Microbiota fecal;
Exposição ambiental;
Criança

Conclusion: Children who lived in a slum and were diagnosed with small intestinal bacterial overgrowth showed lower H/A Z-scores and hemoglobin levels. Furthermore, differences were observed in the fecal microbiota of children with small intestinal bacterial overgrowth, when compared to those without it; specifically, a higher frequency and count of *Salmonella*, and lower counts of *Firmicutes* and total Eubacteria.

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Análise da microbiota fecal de crianças com sobrecrescimento bacteriano no intestino delgado de moradoras de uma favela urbana no Brasil

Resumo

Objetivo: Analisar a composição da microbiota fecal de crianças moradoras de uma favela urbana no Brasil, com e sem sobrecrescimento bacteriano no intestino delgado, e investigar a ocorrência de déficit de crescimento e anemia.

Métodos: Foram estudadas 100 crianças, com idade entre 5 e 11 anos, na cidade de Osasco, São Paulo. Sobrecrescimento bacteriano no intestino delgado foi pesquisado por teste respiratório do hidrogênio e metano no ar expirado com lactulose. Foram mensurados peso, estatura e calculados os índices antropométricos estatura para idade e índice de massa corporal para idade. Foi investigada a ocorrência de anemia, pela avaliação da hemoglobina capilar. A análise dos filós, gêneros e espécies bacterianas em amostras de fezes foi realizada por *polymerase chain reaction* em tempo real.

Resultados: Sobrecrescimento bacteriano no intestino delgado foi diagnosticado em 61,0% das crianças avaliadas. Foi verificada menor média do escore Z do índice estatura para idade ($-0,48 \pm 0,90$ vs. $-0,11 \pm 0,97$ DP) e de hemoglobina capilar ($12,61 \pm 1,03$ vs. $13,44 \pm 1,19$ g/dL) no grupo de crianças com sobrecrescimento bacteriano no intestino delgado, quando comparadas àquelas sem sobrecrescimento bacteriano no intestino delgado ($p < 0,05$). Nas crianças com sobrecrescimento bacteriano no intestino delgado foi observada maior frequência de *Salmonella spp.*, quando comparadas àquelas sem sobrecrescimento bacteriano no intestino delgado (37,7% vs. 10,3%; $p = 0,002$). Maior contagem de Eubactérias totais ($p = 0,014$) e *Firmicutes* ($p = 0,038$) foi observada nas crianças sem sobrecrescimento bacteriano no intestino delgado, enquanto que as crianças com sobrecrescimento bacteriano no intestino delgado apresentaram maior contagem de *Salmonella* ($p = 0,002$).

Conclusão: Nas crianças com diagnóstico de sobrecrescimento bacteriano no intestino delgado verificaram-se menores valores de estatura para idade e de hemoglobina. Foram constatadas diferenças na microbiota fecal das crianças com sobrecrescimento bacteriano no intestino delgado, especificamente, maior frequência e contagem de *Salmonella spp.* e menores contagens de *Firmicutes* e Eubactérias totais.

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Introduction

Over the last few years, several studies have been carried out aiming to broaden the knowledge about the human intestinal microbiota composition. The stool contains a large biomass of bacterial cells, representing a combination of mucosal bacteria and those transiently present in the intestinal lumen.¹ However, little is known about the bacterial communities that adhere to and colonize the small intestine, because of the technical difficulties to collect samples for analysis of the intestinal contents in this gastrointestinal tract region.²

An increase in the amount of bacteria in the small intestine, especially of species common to the colon, characterizes small intestinal bacterial overgrowth (SIBO).³

This clinical condition is often associated with environmental enteropathy, recently renamed environmental enteric dysfunction,⁴ in individuals exposed to unhealthy environments.⁵ Thus, morphological and functional alterations of the small intestine can be observed, derived from a local inflammatory process^{4,5} through the action of pathogenic bacteria, especially Gram-negative,³ triggering a picture of chronic malabsorption of nutrients and consequent growth deficit in children,⁴⁻⁶ even when they are asymptomatic.^{4,7}

Respiratory tests are a non-invasive alternative for SIBO investigation.⁸ In healthy individuals, hydrogen and methane production occurs predominantly by anaerobic bacterial fermentation in the large intestine. In the presence of SIBO, the production of these gases can also be observed in the small

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