

Relationship between Intracellular Magnesium Level, Lung Function, and Level of Asthma Control in Children with Chronic Bronchial Asthma

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Abstract

Background: This study aimed to determine the intracellular (red blood cell (RBC)) magnesium levels in children with chronic bronchial asthma and to determine the relationship between the magnesium level and peak expiratory flow rate (PEFR), type of asthma treatment, and level of asthma control.

Methods: A cross-sectional study was conducted at the Paediatric Clinic, Sarawak General Hospital. A total of 100 children, aged 6–12 years with chronic bronchial asthma, were recruited according to the study criteria. Venous blood samples were obtained to measure the intracellular (RBC) magnesium level using the GBC Avanta Flame Atomic Absorption Spectrophotometer.

Results: Mean age was 8.57 (SD 1.18) years, and 63% of the participants were male. Mean duration of asthma was 62.2 (SD 32.3) months. A normal intracellular magnesium level was found in 95% of the participants, with a mean of 2.27 (SD 0.33) mmol/L. Two-thirds of the participants had a normal peak flow expiratory rate (> 80% of predicted value). About 85% were using both reliever and controller. Almost half of the participants (49%) had chronic asthma that was well-controlled. No significant relationship was found between magnesium level and age ($r = -0.089$, $P = 0.379$), gender ($t = 0.64$, $P = 0.52$), duration of asthma ($r = -0.03$, $P = 0.74$), PEFR ($t = 0.41$, $P = 0.68$), current level of asthma control ($t = 0.02$, $P = 0.97$), and current treatment ($t = 0.414$, $P = 0.680$).

Conclusions: There was no significant intracellular magnesium deficiency in children with chronic bronchial asthma. There was no significant relationship between therapeutic medications used for treatment of children with chronic asthma and intracellular magnesium levels.

Keywords: intracellular, magnesium, asthma

Introduction

Bronchial asthma is a chronic inflammatory disease of the airways and is one of the leading causes of childhood morbidity worldwide. Currently, in the US alone, an estimated 7.1 million children under 18 years suffer from asthma, of which 4.1 million developed an asthma attack in 2011 (1). In a study conducted in Kuala Lumpur, 13.8% of local primary school children were found to be asthmatic (2).

Magnesium plays a crucial role in the regulation of bronchial smooth muscle

contractility and hyper-responsiveness (3). There have been many studies on the relationship between asthmatic exacerbation and blood magnesium level, but findings and conclusions of these studies have varied. Studies in adult patients have shown that low serum magnesium levels were associated with an increased risk of asthma attacks and subsequent hospitalisations compared to the risk in patients with normal magnesium levels (4–6). Studies in children have reported significantly lower intracellular magnesium levels