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Prevalence of Moderate Malnutrition in School-age Children and Its Association with Hypertension and Microalbuminuria

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Abstract **Background.** Previous studies has linked childhood severe malnutrition with hypertension; also association between hypertension and microalbuminuria. Currently there is no study on blood pressure and microalbuminuria in moderately malnourished school-age children. **Methodology/Principal Findings.** A cross-sectional study on children aged 6–12 years from 3 public elementary schools in Bandung, Indonesia between July to September 2016. Weight, height and blood pressure of subjects were measured. Nutritional status were determined using WHO Child Growth Standards. Blood pressure levels were classified, and microalbuminuria were measured using Advia 1800 Analyzer (Siemens, Germany). Sample size was calculated with 18% estimated prevalence, 95% confidence, and 5% precision. Prevalence data were presented as percentage. Differences of blood pressure and microalbuminuria in moderately malnourished and well-nourished subjects were analyzed using Mann Whitney dan Chi-square tests, statistical significance was represented by p<0,05. Out of 235 subjects, 74 were moderately malnourished (prevalence 31,5%) and 161 were well-nourished. The median of systolic blood pressure, diastolic blood pressure and microalbuminuria in the moderately malnourished group were 95 mmHg; 62,5 mmHg; and 5,5 mcg/mg respectively, compared to 95 mmHg; 60 mmHg; and 4 mcg/mg respectively (p=0,741; 0,495; 0,217). **Conclusions.** The prevalence of moderate malnutrition in Indonesian school-age children is quite high. There were no significant differences of blood pressure and microalbuminuria between moderately malnourished and well-nourished children.

Keywords: moderate malnutrtion, children, hypertension, microalbuminuria

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1. Introduction

School-age malnutrition in developing countries is a global health burden, the prevalence ranges from 34–62% [1,2,3,4,5]. In Indonesia, 18,2% children aged 5–12 years old were malnourished in 2013 [6]. Undernutrition in school age–a period of important physical and mental development–could lead to growth impairment, slower cognitive developments, and other health impairments such as high blood pressure [3,4]. Increased blood pressure in childhood and adolescents often leads to hypertension in adulthood, which is a major risk factor for cardiovascular, cerebrovascular and kidney diseases and a leading cause of death in adults worldwide [7,8].

Earlier studies have shown association between severe malnutrition in children and high blood pressure [9,10,11,12] A study in Brazil included moderately malnourished subjects and showed that diastolic blood pressure is significantly higher in those groups than in normal controls [13,14]. Previous studies found significant association between hypertension and microalbuminuria, a marker of endothelial damage [15].

Data of blood pressure and microalbuminuria in school-age children are lacking, especially in the moderately malnourished population in developing countries. The objective of this study is to determine the prevalence of moderate malnutrition in school-age children, and the association among moderate malnutrition with hypertension and microalbuminuria in a developing country.

2. Materials and Methods

This cross-sectional study was performed from June to September 2016 in three elementary schools consisting of students from middle-low income socioeconomic families in Bandung, Indonesia. Subjects were otherwise healthy students aged 6–12 years with parental consent. Subjects who were overweight, obese or severely malnourished and subjects with known history of kidney disease, heart disease or diabetes mellitus were excluded.

Prevalence was calculated and presented as percentage. Weight was measured using an electronic scale (Seca W60094[1009152], USA) with 10 g precision. Height was measured using a mobile stadiometer accurate to the