



ORIGINAL ARTICLE

Exploring the relationship of peripheral TBIL, RBC, and HGB with blood pressure during childhood and adolescence[☆]

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KEYWORDS

Bilirubin;
Erythrocyte;
Hemoglobin;
Blood pressure

Abstract

Q2 Objective: Total bilirubin is beneficial for protecting cardiovascular diseases in adults. The authors aimed to investigate the association of total bilirubin, red blood cell, and hemoglobin levels with the prevalence of high blood pressure in children and adolescents.

Methods: A total of 3776 students (aged from 6 to 16 years old) were examined using cluster sampling. Pre-high blood pressure and high blood pressure were respectively defined as the point of 90th and 95th percentiles based on the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. Both systolic and diastolic blood pressure were standardized into z-scores.

Results: Peripheral total bilirubin, red blood cell and hemoglobin levels were significantly correlated with age, AND also varied with gender. Peripheral total bilirubin was negatively correlated with both systolic in 6- and 9-year-old boys, whilst positively correlated with diastolic blood pressure in the 12-year-old boys and 13- to 15-year-old girls ($p < 0.05$). Higher levels of red blood cell and hemoglobin were observed in pre-high blood pressure and high blood pressure students when compared with their normotensive peers ($p < 0.01$). The increases in red blood cell and hemoglobin were significantly associated with high blood pressure after adjusting for confounding factors. The ORs (95% CI) of each of the increases were 2.44 (1.52–3.92) and 1.04 (1.03–1.06), respectively. No statistical association between total bilirubin and high blood pressure was observed ($p > 0.05$).

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PALAVRAS-CHAVE

Bilirrubina;
Eritrócito;
Hemoglobina;
Pressão arterial

Conclusion: Total bilirubin could be weakly correlated with both systolic and diastolic blood pressure, as correlations varied with age and gender in children and adolescents; in turn, the increased levels of red blood cell and hemoglobin are proposed to be positively associated with the prevalence of high blood pressure.

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Explorando a relação entre os níveis periféricos de BRBT, GV e HGB e a pressão arterial na infância e adolescência

Resumo

Objetivo: A bilirrubina total é benéfica para proteger contra doenças cardiovasculares em adultos. Nosso objetivo foi investigar a associação dos níveis de bilirrubina total, glóbulos vermelhos e hemoglobina com a prevalência de pressão arterial elevada em crianças e adolescentes.

Métodos: Um total de 3.776 estudantes (com idade entre 6-16 anos) foram examinados utilizando uma amostra em blocos. A pressão arterial elevada anterior e a pressão arterial elevada foram definidas como o 90^o e 95^o percentil, respectivamente, com base nos critérios do Quarto Relatório sobre Diagnóstico, Avaliação e Tratamento da Pressão Arterial elevada em Crianças e Adolescentes. A pressão arterial sistólica e pressão arterial diastólica foram padronizadas no escore z.

Resultados: Os níveis periféricos de bilirrubina total, glóbulos vermelhos e hemoglobina foram significativamente correlacionados à idade, que também variou de acordo com o sexo. A bilirrubina total periférica apresentou uma correlação negativa com a pressão arterial sistólica em meninos com 6 e 9 anos, ao passo que apresentou uma correlação positiva com a pressão arterial diastólica em meninos de 12 anos e meninas de 13 a 15 anos ($p < 0,05$). Foram observados níveis mais elevados de glóbulos vermelhos e hemoglobina em estudantes com pressão arterial elevada anterior e pressão arterial elevada em comparação a indivíduos normotensos ($p < 0,01$). Os aumentos de glóbulos vermelhos e hemoglobina tiveram uma associação significativa com a pressão arterial elevada após ajuste dos fatores de confusão. As RC (IC de 95%) de cada um dos aumentos foram 2,44 (1,52-3,92) e 1,04 (1,03-1,06) respectivamente. Não foi observada nenhuma associação estatística entre o nível de bilirrubina total e a pressão arterial elevada ($p > 0,05$).

Conclusão: A bilirrubina total pode ter correlações fracas com a pressão arterial sistólica e a pressão arterial diastólica, variando de acordo com a idade e o sexo em crianças e adolescentes, enquanto isso, propõe-se que o aumento dos níveis de glóbulos vermelhos e hemoglobina está positivamente associado à prevalência de pressão arterial elevada.

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Introduction

High blood pressure (HBP) is widely recognized as one of the most important challenges of the global public health among adults in both developed and developing countries.¹ Being a leading risk factor of cardiovascular diseases (such as stroke, ischemic heart disease, and hypertensive heart disease), HBP is one of the main causes of morbidity and mortality worldwide.² It has been demonstrated that BP levels in childhood and adolescence greatly impact the onset of hypertension in adulthood.³ A school-based survey in China with individuals aged from 6 to 13 years revealed that the overall prevalence of HBP was 18.4% (boys: 20.2%; girls: 16.3%),⁴ indicating that, in this population, HBP is likely to be a serious public health issue. Therefore, elevated BP in children should be of significant concern, calling for early detection and intervention to prevent future cardiovascular sequelae of pediatric HBP.

Bilirubin (BIL), a member of the super family of tetrapyrrolic compounds, is a metabolic end-product of heme degradation in the systemic circulation.⁵ BIL deriving from the degradation of hemoglobin (HGB) in anile red blood cells (RBC)⁶ has been widely used as a marker of cholestasis in the clinical assessment of liver function.⁷ Recently, several prospective population-based cohort studies have reported an inverse association between total BIL (TBIL) and cardiovascular diseases.^{8,9} A moderate elevation of peripheral BIL level has been shown to lower the risk of the onset and progression of coronary artery disease and atherosclerosis.¹⁰ It was suggested that BIL could play a role in the cell defense machinery in response to oxidative stress, a primary stimulus to the pathogenesis of hypertension.¹¹⁻¹³ However, the relationship between peripheral TBIL and HBP in children and adolescents is barely understood. Thus, the authors aimed to explore the relationship between peripheral TBIL, RBC, and HGB with the prevalence of HBP, as

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