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Effects of Prenatal Growth Status on Subsequent Childhood Renal Function Related to High Blood Pressure

Bohyun Park,[1] **Jung Won Lee**,[2] **Hae Soon Kim**,[2] **Eun Ae Park**,[2] **Su Jin Cho**,[2] **and Hyesook Park**[1]

[1]Department of Preventive Medicine, Ewha Womans University School of Medicine, Seoul, Korea
[2]Department of Pediatrics, Ewha Womans University School of Medicine, Seoul, Korea

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Address for Correspondence:
Hyesook Park, MD, PhD
Department of Preventive Medicine, Ewha Womans University School of Medicine, 25 Magokdong-ro 2-gil, Gangseo-gu, Seoul 07804, Korea.
E-mail: hpark@ewha.ac.kr

ORCID iDs
Bohyun Park
https://orcid.org/0000-0002-8538-9662
Jung Won Lee
https://orcid.org/0000-0003-1846-3153
Hae Soon Kim
https://orcid.org/0000-0002-6976-6878
Eun Ae Park
https://orcid.org/0000-0002-1685-4276
Su Jin Cho
https://orcid.org/0000-0002-3851-9073
Hyesook Park
https://orcid.org/0000-0002-9359-6522

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ABSTRACT

Background: Hypertension is one of the major causes of chronic diseases. The effect on high blood pressure (BP) with fetal growth restriction is now well-established. Recent studies suggest that a reduced number of nephrons programmed during the intrauterine period contribute to a subsequently elevated BP, due to a permanent nephron deficit. However, few studies have examined this in children. We investigated the effects of low birth weight (LBW) and preterm birth on the renal function markers related to a high BP in childhood.
Methods: We used data from 304 children aged 7–12 years who participated in the 2014 Ewha Birth and Growth Cohort survey in Korea. We assessed the serum uric acid, cystatin C, blood urea nitrogen (BUN), creatinine levels, and the estimated glomerular filtration rate (eGFR) in childhood. Anthropometric characteristics, BP in childhood, birth weight and gestational age were collected.
Results: The serum uric acid was significantly higher in LBW children (4.0 mg/dL) than in normal birth weight children (3.7 mg/dL). The cystatin C levels were highest among children who were very preterm (0.89 mg/dL) compared with those who were not (preterm, 0.84 mg/dL; normal, 0.81 mg/dL), although the result was only borderline significant (P for trend = 0.06). Decreased birth weight was found to be significantly associated with an increased serum BUN level in childhood. In the analysis of the effects of renal function on BP, subjects with an eGFR lower than the median value had a significantly higher diastolic BP in childhood (difference = 2.4 mmHg; $P < 0.05$).
Conclusion: These findings suggest that LBW and preterm birth are risk factors for increased serum levels of renal function markers in childhood. Reduced eGFR levels were significantly associated with elevated diastolic BP in childhood. It is necessary to identify vulnerable individuals during their life and intervene appropriately to reduce the risk of an increased BP in the future.

Keywords: Child; Renal Insufficiency; Premature Birth; Low Birth Weight; Blood Pressure

INTRODUCTION

Raised blood pressure (BP) is the leading global risk factor for many non-communicable diseases.[1] In international surveys, the estimated disease burden and deaths associated with high BP increased substantially between 1990 and 2015.[2] Recent longitudinal studies