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Birth History and the Risk for Development of Hypertension in Adolescence

Roshan P. George[1] and Joseph T. Flynn[2]

[1]Department of Pediatrics, Emory University and Division of Nephrology, Children's Healthcare of Atlanta, Atlanta, Georgia, USA; and [2]Department of Pediatrics, University of Washington School of Medicine; and Division of Nephrology, Seattle Children's Hospital, Seattle, Washington, USA

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See Clinical Research on Page 1228

A 16-year-old is referred to you for evaluation of hypertension noted in the primary care provider's office. Office blood pressure (BP) averages were 138/78 mm Hg; 24-hour ambulatory BP monitoring shows a mean wake BP of 136/82, and mean sleep BP of 112/64 mm Hg. The patient has a normal body mass index and aside from the BP, their physical examination is normal. Past medical history is remarkable for preterm birth at 36 weeks gestation; there was intrauterine growth retardation and birthweight (BW) was 1.871 kg. Subsequent growth and development were normal and there have been no chronic medical problems. Both parents and 3 of the 4 grandparents have hypertension. Laboratory evaluation is remarkable for a reduced estimated glomerular filtration rate of 77 ml/min per 1.73 m^2 but all other studies, including kidney ultrasonography are normal. You wonder if this patient's prenatal and birth history might contribute to the hypertension you are seeing now.

The Scope of the Problem

The estimated worldwide prevalence of preterm birth at the beginning of this decade was 9.9% (95% confidence interval: 9.1–11.2) translating to 13.4 million preterm livebirths (12.3–15.2 million).[1] In 2020, an estimated 14.7% of all global births, approximately 19.8 million newborns, had low BW (LBW).[2]

Remarkable improvements have been made in the technology and medical care utilized in the resuscitation and management of neonates in the past decades, leading to increasing survivorship following LBW and early preterm births. These cohorts have now reached adolescence and young adulthood, and chronic medical concerns associated with abnormal birth history such as hypertension are coming to light.[3-5]

Data linking prematurity, LBW, and intrauterine growth retardation to the future development of hypertension are inconsistent and have been linked to a variety of risk factors. For individuals born prematurely, impaired nephrogenesis, abnormal development of microvasculature, increased aortic stiffness, exposure to oxidative stress, and inflammation have all been implicated.[6] LBW is associated with the development of both hypertension and chronic kidney disease.[7] Additional risk factors such as rapid postnatal weight gain, sedentary lifestyle, stress, and effects of other systemic conditions, make this population exceptionally vulnerable to negative long term renal and cardiovascular outcomes.

The study by Tzvi-Behr *et al.*[8] in the May issue of Kidney International Reports adds to this current literature, through the evaluation of a cohort of 513,802 adolescents (mean age: 17.3 ± 0.9 years) examined at the time of recruitment to the Israel Defense Forces. Among 48,994 participants with gestational age (GA) data available, the risk of hypertension or proteinuria was assessed in adolescents born prematurely or small for GA. They found that adolescents born as very preterm (28 weeks, 0 days to 31 weeks, 6 days) and extremely preterm (<27 week, 6 days) infants and those born with very LBW (1000–1500 g) or extremely LBW (<1000 g) had higher incidence of hypertensive-range BP (55%, 47%, 19%, and 12% respectively).

No significant association between BW adjusted to GA and hypertension was noted. Overweight (body mass index between 85th and 94th percentiles) and obese (body mass index > 95th percentile) adolescents, if born as very LBW and extremely LBW, had further increased hypertensive-range BP rate. Proteinuria was diagnosed in 0.33% of study cohort of study cohort, with

Correspondence: Roshan P. George, Division of Pediatric Nephrology, Emory University and Children's Healthcare of Atlanta, 2015 Uppergate Dr. NE, Atlanta, Georgia 30322, USA. E-mail: roshan.punnoose.george@emory.edu

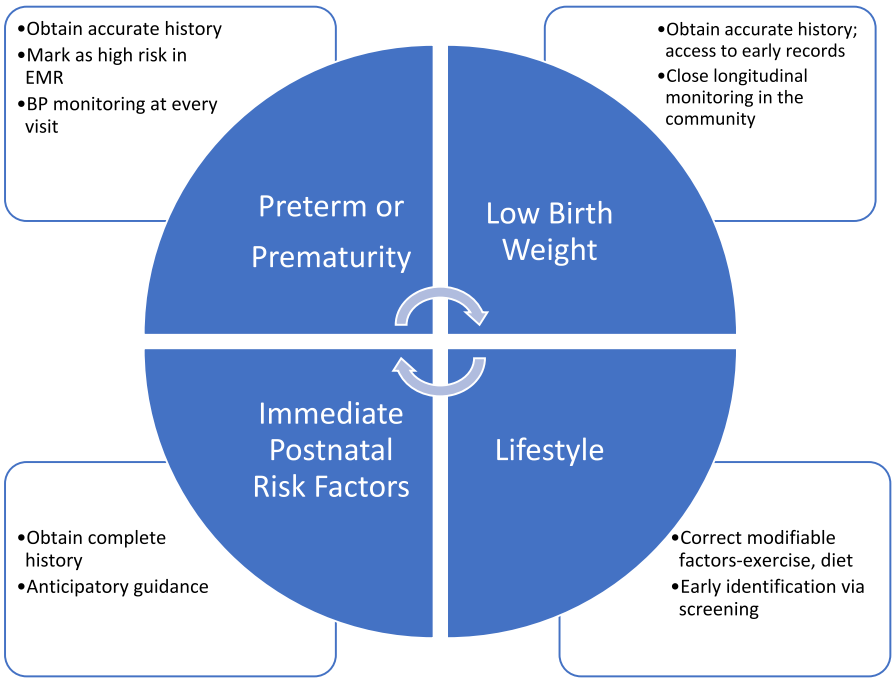

Figure 1. Risk factors for development of hypertension and basic consideration for community providers for screening and management. BP, blood pressure; EMR, electronic medical record.

no significant difference between BW or GA categories. The authors concluded that the birth history of adolescents born as VLBW or as significant preterm, were associated with high BP in adolescence.

How Does This Impact our Clinical Practice and our Overarching Recommendations?

Accurate history taking and integration of medical records to obtain information about birth history is essential. Better screening BP checks and further workup such as ambulatory BP monitoring and assessment of end organ damage according to guidelines should be employed for patients considered at higher risk.[9]

On a larger scale, advocacy for widespread and equitable access to these screening and diagnostic capabilities and availability of treatment options for all ages, such as suspension formulation for smaller children for the management of hypertension should be possible.

Better community education to maintain high index of suspicion and further research into etiology and management, especially about improvement in nutrition and prevention of obesity will be key factors in mitigating some of the effects of birth history (Figure 1).

This study is retrospective; therefore, it is challenging to draw broad conclusions. There are other limitations such as a mostly homogenous population, small percentage of subjects with information on GA, single visit BP checks which do not conform to guidelines, and limited data on confounding factors such as history of postnatal acute kidney injury. In addition, information about proteinuria and other markers of potential chronic kidney disease was not available. Even with these limitations, the study adds to the existing literature about the impact of birth history, in future development of chronic conditions.

There remains a need for longitudinal, prospective studies in various populations, globally to understand long term effects of prematurity and low birth weight on renal and cardiovascular outcomes.

DISCLOSURE

All the authors declared no competing interests.

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