Influence of Race and Obesity on the Renin-Angiotensin-Aldosterone System in Adolescents Born Preterm

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Background: While neonatal morbidity and mortality in preterm infants have improved dramatically, the long-term cardiovascular and renal consequences of prematurity are incompletely understood. Prematurity may induce programmed changes in the renin-angiotensin (Ang)-aldosterone system (RAAS), a key regulator of cardiovascular and renal function. Race and obesity influence the RAAS and may modify the effects of prematurity on the RAAS. We hypothesized that the RAAS differs by race and obesity in adolescents born prematurely with very low birth weight (VLBW).
Methods: A cohort of 173 adolescents with VLBW was evaluated at age 14. We measured renin, aldosterone, Ang II, and Ang-(1-7) in the plasma; Ang II, Ang-(1-7), and creatinine in the urine; and we calculated the aldosterone/renin ratio and the Ang II/Ang-(1-7) ratios. We used general linear regression models to estimate the difference in the RAAS according to overweight/obesity (body mass index ≥85% for age and sex) and race, adjusting for confounding variables. Results: On unadjusted analyses as well as analyses adjusted for sex, antenatal corticosteroid exposure, and maternal hypertension, black race was associated with decreased urinary Ang-(1-7)/creatinine (adjusted estimate -0.18, 95% CI -0.36 to -0.01, $p = 0.04$) and decreased renin (-0.36, -0.68 to -0.05, $p = 0.03$). In analyses stratified by sex, black males, but not black females, had decreased renin (-0.63, -1.1 to -0.16, $p = 0.01$) and aldosterone (-0.61, -1.19 to -0.04, $p = 0.04$). Obesity was associated with increased urinary Ang II/(1-7) (0.29, 0.04 to 0.53, $p = 0.02$), decreased plasma Ang-(1-7) (-0.4, -0.8 to -0.002, $p = 0.05$), increased plasma Ang II (0.21, 0.03 to 0.39, $p = 0.02$), and increased plasma Ang II/(1-7) (0.61, 0.2 to 1.01, $p = 0.004$).
Conclusions: In adolescents born with VLBW, there is racial variation in the RAAS. Black adolescents, especially males, have an altered renal RAAS and lower renin and aldosterone. Obesity is associated with a potentially deleterious alteration in the RAAS, with a shift in the renal and systemic RAAS towards Ang II and away from Ang-(1-7). These shifts in the RAAS associated with race and obesity may increase the risk of renal and cardiovascular disease in adolescents born with VLBW.

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