

# Hair Cortisol Concentrations in Overweight and Obese Children and Adolescents

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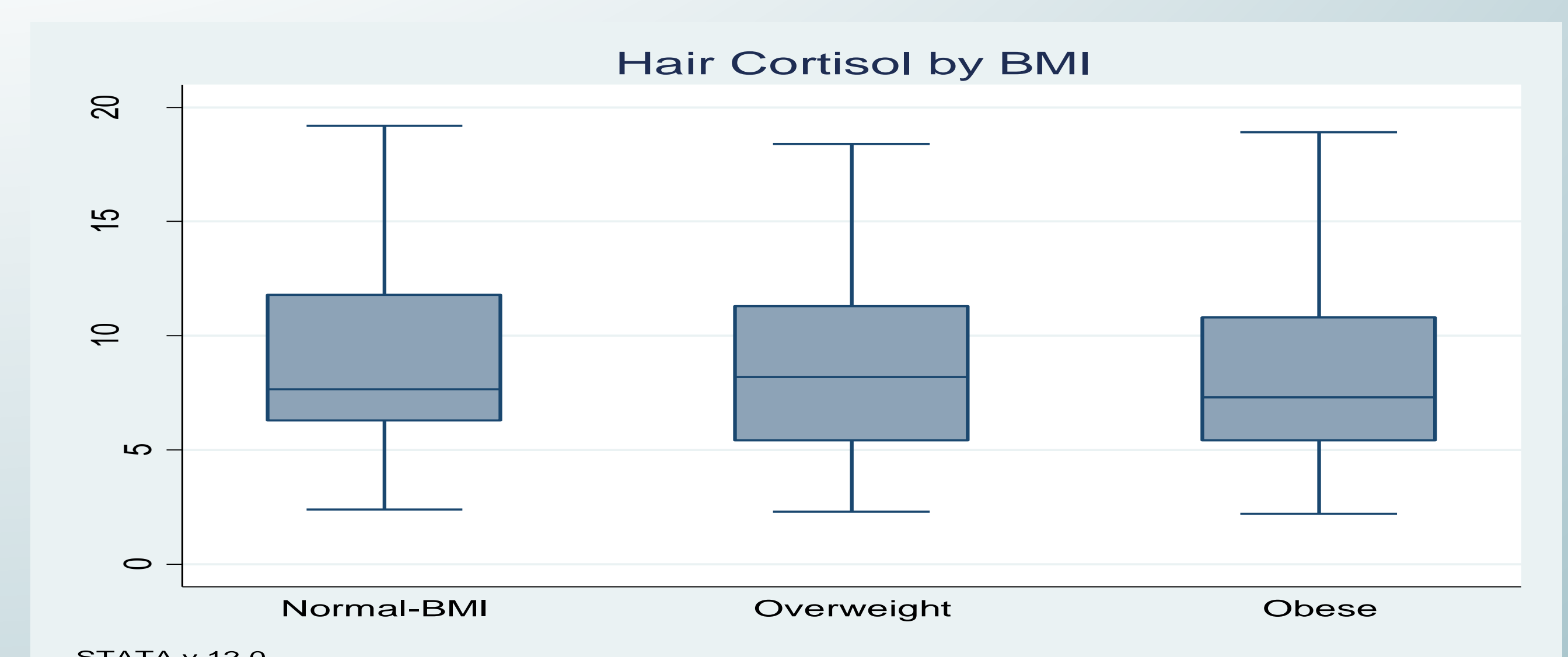
**Background:** Obesity in childhood and adolescence represents a major health problem of our century that has reached epidemic proportions globally during the last decades. In obese subjects, a relatively high cortisol output in urine has been observed compared to nonobese individuals. However, cortisol concentrations in blood, saliva, and urine in association with obesity have not been consistent across studies. Hair cortisol concentrations (HCC) determined in scalp hair provide a marker for long-term cortisol exposure, and have been associated with cardiovascular disease.

**Objective and Hypotheses:** The aim of our study was to examine the association of cortisol concentrations both in serum and hair with BMI in childhood and adolescence and to assess its relation with clinical and endocrinologic parameters.

**Methods:** Three hundred (n=300) children and adolescents aged 4-18 years [mean age  $\pm$  SEM: 10.49  $\pm$  2.57 years; 140 (46.7%) obese, 94 (31.3%) overweight, 66 (22%) normal-weight; 76 males, 224 females] were studied prospectively. The study was approved by the local Committee on the Ethics of Human Research. Written informed consent was obtained in all cases by a parent of all participants, and assent was given by children older than 7 years. All participants underwent clinical examination, including pubertal assessment and standard anthropometric measurements were obtained by a single trained observer.

A blood sample for baseline hematological, biochemical and endocrinologic investigations was drawn at 08:00h following a 12-hour fast. Scalp hair samples were collected from the posterior vertex and HCC was measured from the proximal 3cm hair segment using Electrochemiluminescence immunoassay.

**Results:** Obese subjects had significantly higher systolic (SBP) and diastolic blood pressure (DBP), waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) than overweight and normal-weight subjects. Obese subjects had significantly higher concentrations of ALT,  $\gamma$ -GT, LDL, triglycerides, ApoB, Insulin, HbA1C and HOMA-IR index, and lower HDL, ApoA1, 25-OH-Vitamin D and QUICKI than overweight and normal-BMI subjects. Plasma ACTH and serum cortisol did not differ between the groups. No significant difference was found in HCC among groups. Multivariate linear regression analysis demonstrated no significant relation between HCC and ApoA1, after adjustment for potential confounders such as age, gender and puberty.



**Conclusions:** The findings of our study indicate that obesity is not associated with elevated HCC, however, further studies are necessary to delineate this association.

