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Introduction

In men there is a strong relationship between androgens and erythropoiesis; however this has not been shown in women. Patients with congenital adrenal hyperplasia (CAH) if uncontrolled may have high androgen levels and if over treated with glucocorticoids low androgen levels. Therefore CAH provides a potential model to examine the relationship between androgens and erythropoiesis in women.

Aim of the study was to investigate the relationship between androgens and erythropoiesis in females with CAH.

Methodology

- A retrospective analysis of data from two cohorts of CAH patients. Cohort 1 comprised CAH women from STH, UK (the training set: n=23) and cohort 2 from NIH, US (the validation set: n=53).
- Demographic data, CAH phenotype and medical history was gathered from case notes. Androgen levels and blood counts performed on the same day for every patient were collected.
- Group differences was assessed by Student's t-test and associations between variables with adjustment for confounders by partial correlation.

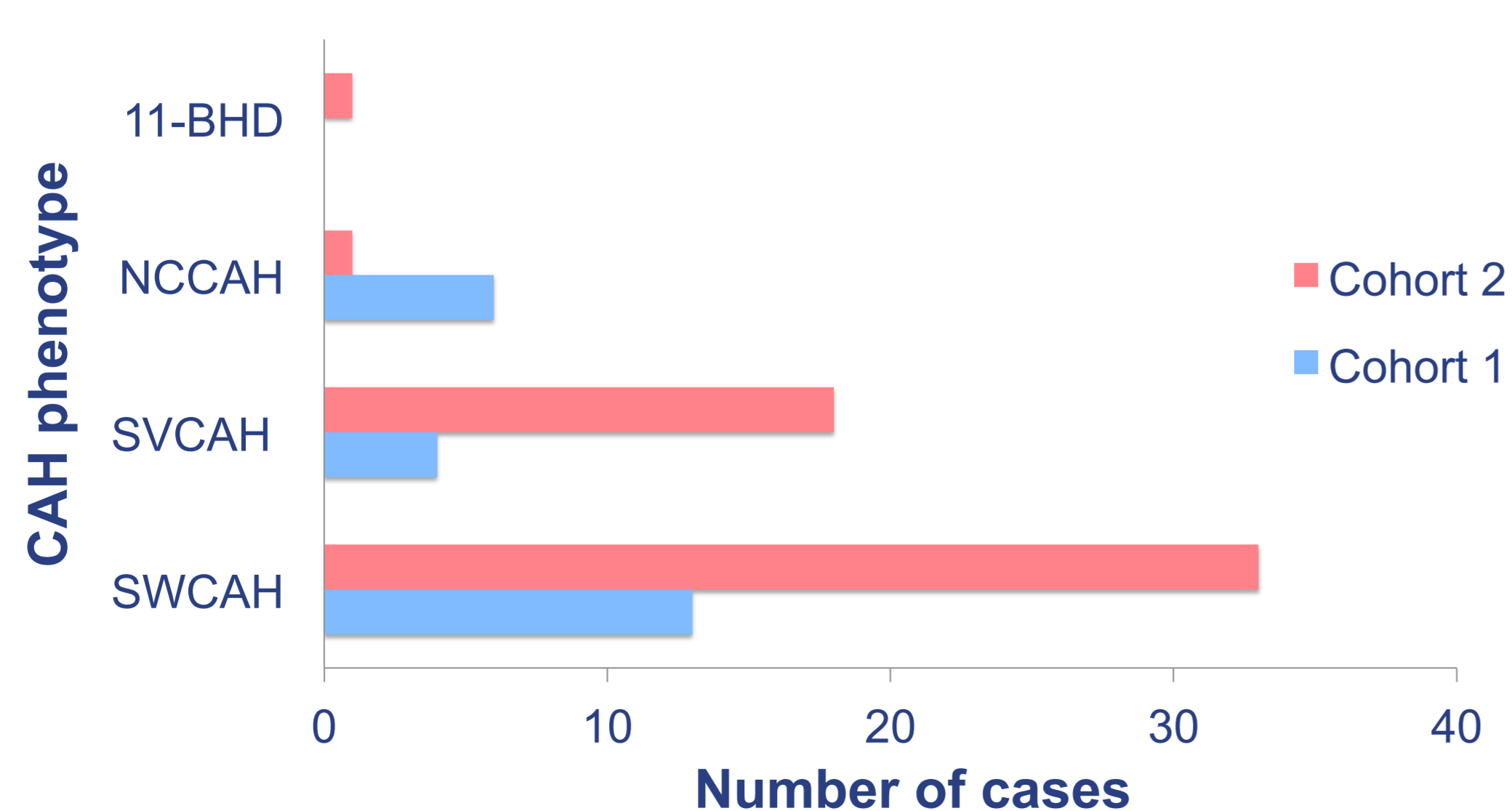
Results

- Baseline characteristics did not differ significantly between the two cohorts. Mean age was 35.3 (SD ± 14) years in the cohort 1 and 30.8 (SD ± 11.4) years in the cohort 2.

	Cohort 1 (n = 23) Mean (SD)	Cohort 2 (n = 53) Mean (SD)	Group difference P value
Age (years)	35.3 (13.9)	30.8 (11.4)	0.148
Height (m)	1.58 (0.08)	1.57 (0.08)	0.687
Weight (kg)	86.4 (27.2)	78.2 (29.0)	0.323
Body mass index (kg/m ²)	34.6 (11.4)	31.7 (12.1)	0.396
Glucocorticoid dose (mg/day)	28.2 (11.2)	29.4 (13.4)	0.692
Haemoglobin (g/l)	140.4 (13.3)	134.1 (10.5)	0.031
Haematocrit (%)	41.7 (04.0)	39.9 (3.1)	0.035
17-OHP (nmol/l)	98.3 (151.4)	127.1 (150.1)	0.484
Androstenedione (nmol/l)	12.4 (13.3)	15.4 (19.6)	0.519
Testosterone (nmol/l)	3.2(6.1)	2.7 (5.5)	0.748

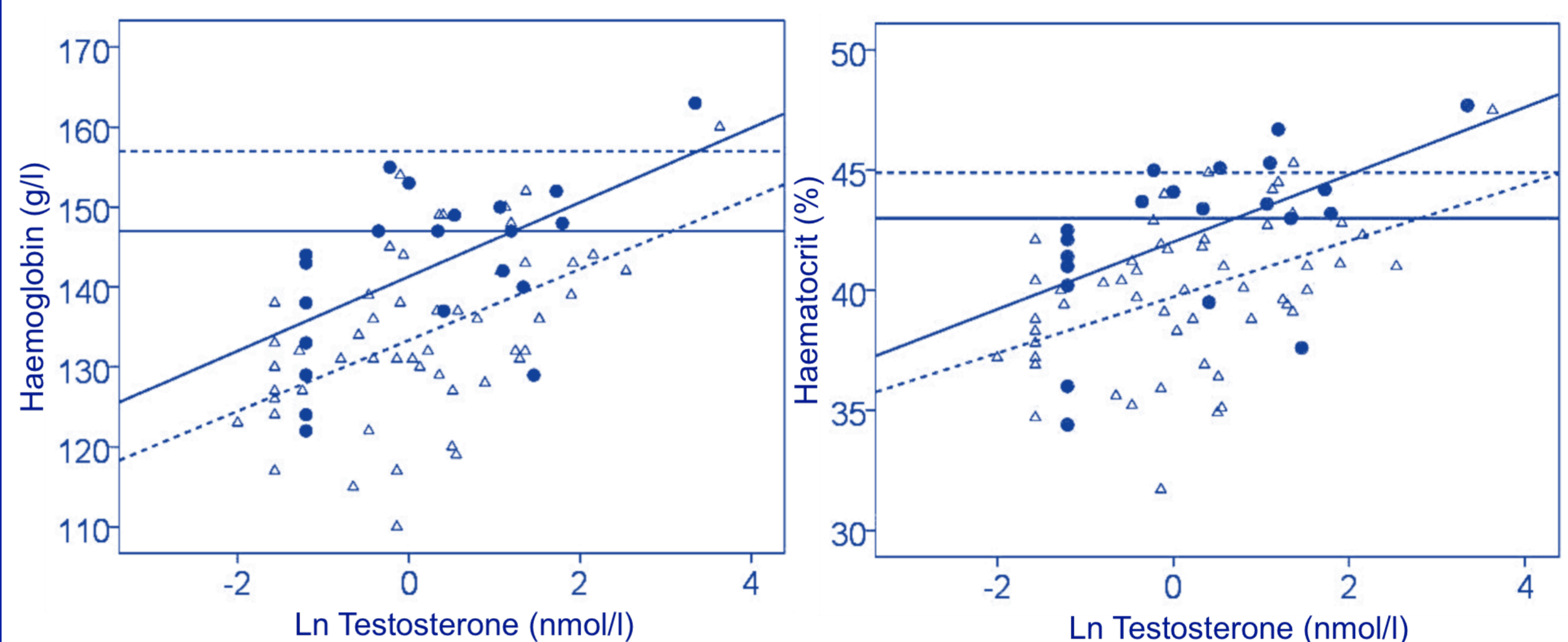
Table 1: Baseline characteristics of the two cohorts and the p value for mean differences

- Majority of both cohorts had a diagnosis of SW CAH; cohort1 n=13(34%) , cohort 2 n=33 (62.3%).



Graph 1: distribution of CAH phenotype (SWCAH: Salt wasting CAH, SVCAH: simple virilizing CAH, NCCAH: non classic CAH, 11-BHD: 11- β hydroxylase deficiency)

- Hb levels and Hct were significantly higher in cohort 1 than those in cohort 2 women while there were no group differences in androgen levels or glucocorticoid treatment dose.
- Elevated Hb and Hct above upper limit of reference were found in 30.4% and 47.8% of women, respectively, in cohort 1 compared to <4% of women in cohort 2, although cohort 2 had a higher upper limit of normal.
- Within cohort 1, compared to women with normal Hb levels or Hct, women with raised values had higher androgens, but did not differ in glucocorticoid treatment dose, stature or BMI.
- Ln testosterone showed significant age-adjusted correlations (P<0.001) with Hb (r=0.712) and Hct (r=0.705) in the training set (cohort 1) and validation set (cohort 2)
- This correlation remained significant after further adjustments for CAH status, glucocorticoid treatment dose and serum creatinine (Hb: r=0.524; Hct: r=0.466) .



Graph 2 : Relationship between haemoglobin and testosterone levels in women with CAH*

Graph 3 : Relationship between haematocrit and testosterone levels in women with CAH*

*● and solid lines Cohort 1; △ and dotted lines cohort 2; Horizontal lines upper limit of normal

- Hb and Hct correlated less strongly with the androgen precursors androstenedione and 17-OHP.

Conclusions

- There is a positive and strong correlation between total testosterone and erythropoiesis in women with CAH, which was seen across two different cohorts. There is a weaker but significant correlation with androgen precursors.
- Suboptimal control of androgens in this group of patients may increase the risk of either polycythaemia or anaemia.
- Haemoglobin and haematocrit may be used as additional biomarkers of disease control in women with CAH but larger prospective studies are necessary to confirm this.

Acknowledgements

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Reference

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