



Sex hormones and gonadal size in pubertal girls born small or appropriate for gestational age.

Indre Petraitiene, Kristina Jariene, Astra Vitkauskiene Kerstin Albertsson Wikland and Rasa Verkauskiene

Institute of Endocrinology, Lithuanian University of Health Sciences

BACKGROUND AND AIM

Background: Small for gestational age (SGA) birth size has been associated with various metabolic, hormonal and reproductive problems in later life.

Objective and hypotheses: We aimed to compare concentrations of sex hormones, uterine and ovarian sizes in SGA and appropriate for gestational age (AGA) adolescent girls.

METHODS

23 SGA and 47 AGA pubertal 11-14 years old girls (age 13.2 ± 1.94 years, median Tanner pubertal stage 4 (interquartile range 1) were recruited from the prospective newborn cohort. Sex hormones concentration and gonadal size were analyzed in both groups, adjusting for age and pubertal stage. Data are presented as mean and standard deviation.

Comparisons between groups were adjusted for age and pubertal stage. In postmenarcheal girls blood samples were taken in follicular phase of menstrual cycle or at least 2 months of secondary amenorrhea.

Table 1. Demographic and anthropometric characteristics of study children.

	SGA	AGA	P value
Age (years)	12.6 \pm 1.10	13.6 \pm 1.42	0.005
Height SDS	-0.34 \pm 1.21	0.28 \pm 0.98	0.024
Weight SDS	-0.34 \pm 1.35	0.35 \pm 1.36	0.051
BMI SDS	-0.37 \pm 1.45	0.19 \pm 1.32	0.110
Tanner pubertal stage, median (interquartile range)	3 [1]	4 [1]	0.231*
Age at menarche (years)	11.1 \pm 1.61	12.2 \pm 0.94	0.030
Birth weight (g)	2487 \pm 349	3494 \pm 402	0.001
Birth length (cm)	46.91 \pm 2.76	50.81 \pm 1.93	0.001
Gestational age (weeks)	38.7 \pm 1.75	39.5 \pm 1.3	0.168
Birth BMI (kg/m ²)	11.26 \pm 1.08	13.51 \pm 1.06	0.001
Ponderal index at birth (kg/m ³)	2.41 \pm 0.28	2.66 \pm 0.22	0.001
Mothers age at delivery (years)	26.3 \pm 4.13	29.3 \pm 5.47	0.028

* P value of χ^2 test was used for comparisons between SGA and AGA children.

RESULTS

No significant differences in LH, FSH, Estradiol and SHBG concentrations were found between SGA and AGA groups (4.26 ± 3.80 vs. 3.35 ± 2.63 IU/L, $p=0.157$; 3.79 ± 1.75 vs. 4.08 ± 2.33 IU/L, $p=0.983$; 326.86 ± 208.01 vs. 427.45 ± 309.91 pmol/L, $p=0.616$; 40.83 ± 16.46 vs. 44.11 ± 20.76 nmol/L, $p=0.881$, respectively). SGA girls had significantly higher Testosterone levels and Free Androgen Index (Figure 1). Uterine size was significantly smaller in girls born SGA and ovarian volume tended to be smaller as well in girls born SGA (Figure 2).

Both uterine and ovarian sizes correlated directly with Estradiol levels (Table 2). Direct relationship between ovarian size and SHBG levels was also found in both groups combined ($r=0.522$, $p=0.001$). The age at menarche was related with smaller birth size (Table 3), but did not correlated with current BMI ($r=0.010$, $p=0.972$).

Figure 1. Mean Testosterone (pmol/L) level and Free Androgen Index in SGA and AGA girls

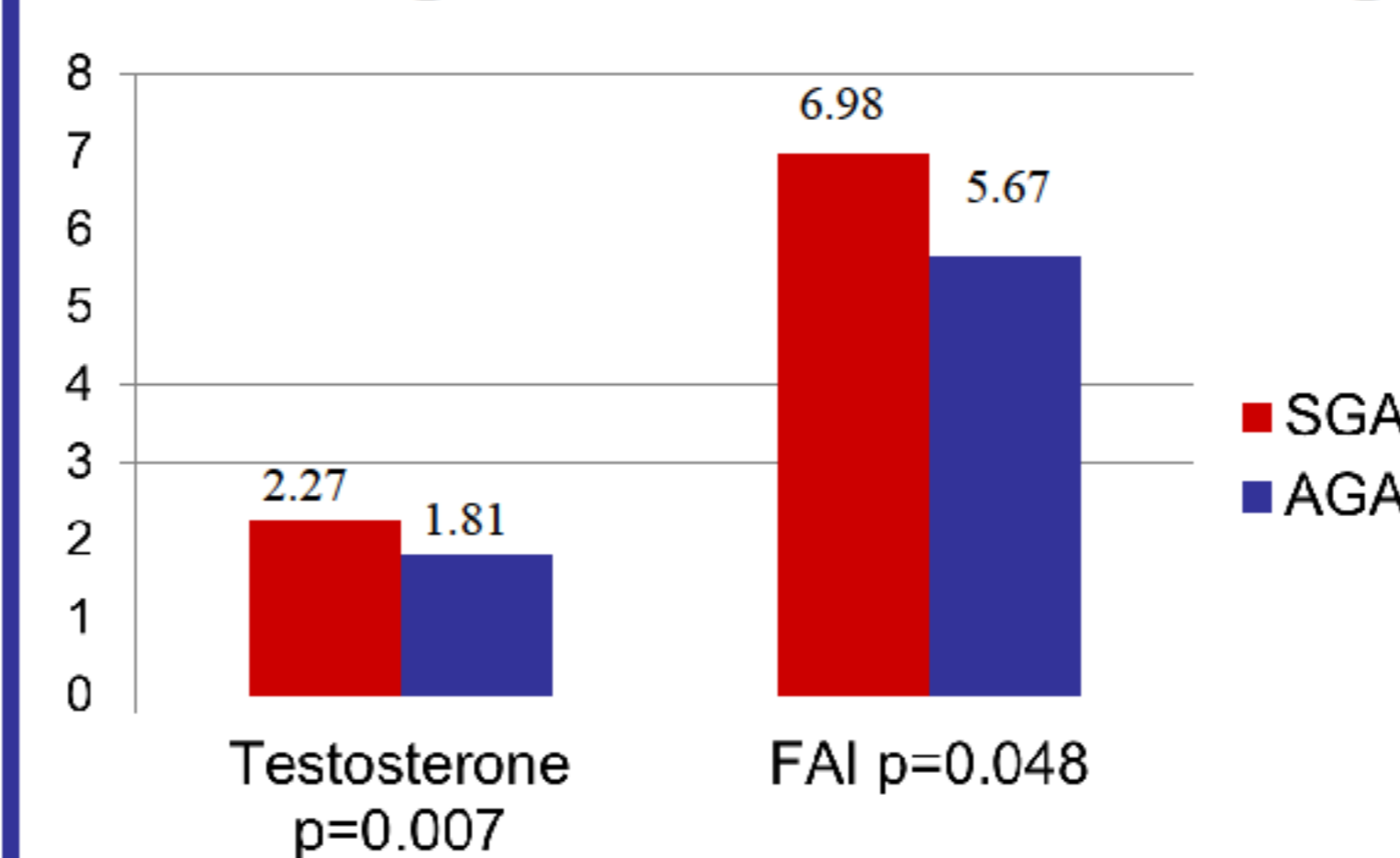


Figure 2. Mean uterine size and ovarian volume (cm³) in SGA and AGA girls

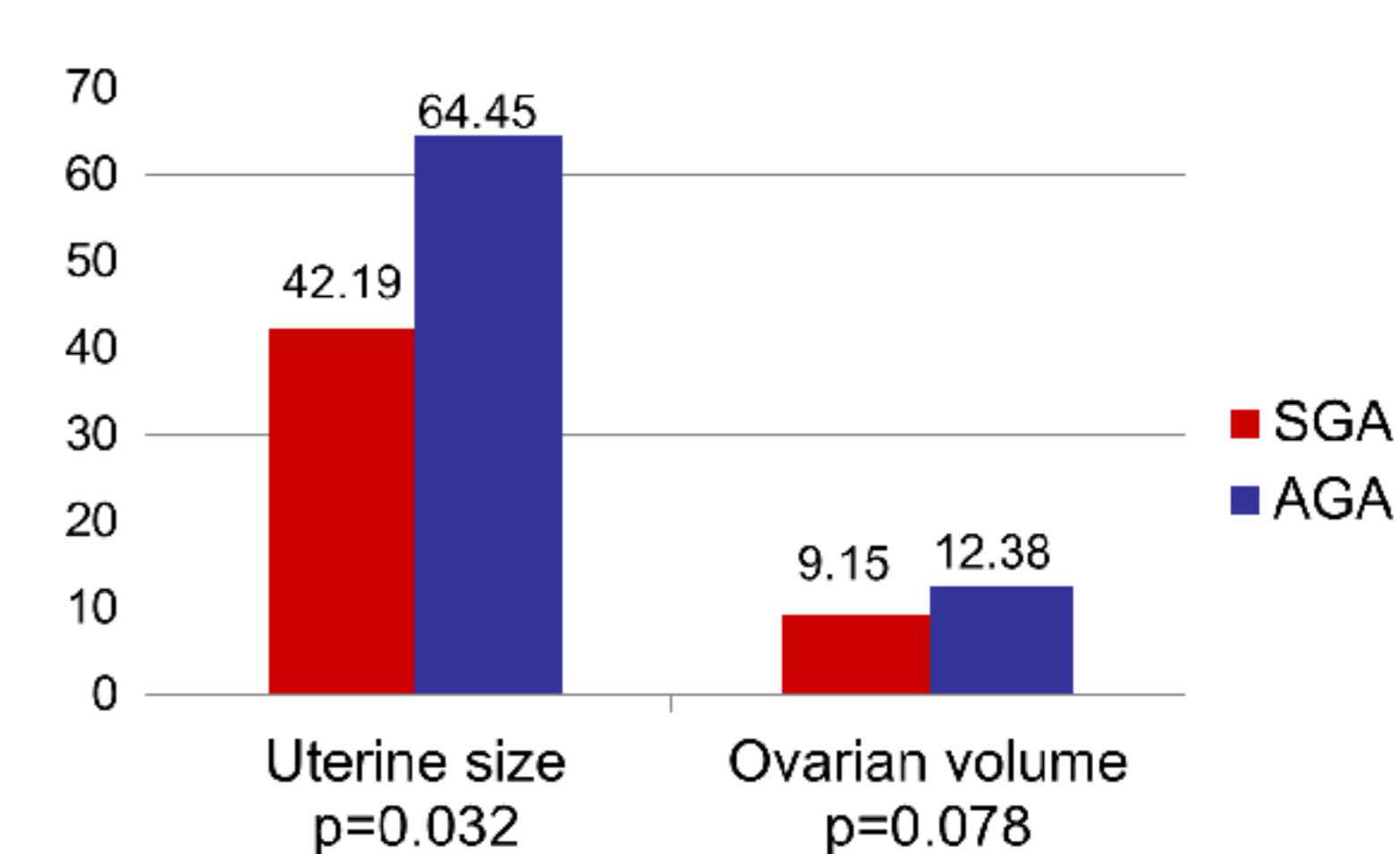


Table 2. Correlations between gonadal sizes and Estradiol level

	Correlation coefficient (r)
Uterine size	0.344**
Ovarian volume	0.321*

* $P < 0.05$; ** $P < 0.01$

Table 3. Correlations between age at menarche and perinatal factors

	Correlation coefficient (r)
Birth weight	0.514**
Birth length	0.375*
Gestational age	0.591*
Birth BMI	0.519**
Ponderal index at birth	0.371*

* $P < 0.05$; ** $P < 0.01$

CONCLUSION

Pubertal SGA girls have earlier age at menarche, higher markers of biochemical hyperandrogenism and smaller uterine size, which might influence future reproductive function in these girls.

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