

Growth, body composition and metabolic parameters during childhood in a UK cohort of children born small for gestational age

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Introduction

Children born small for gestational age (SGA) represent a heterogeneous group at risk for short adult stature and long term metabolic complications.

During the first 2-4 years of life, children born SGA are usually able to catch up their peers born appropriate for gestational age by means of a faster rate of weight and/or length gain. This catch up growth might contribute to an increased risk of obesity, insulin resistance, cardiovascular disease and other adverse outcomes later in life.

Aims

To examine growth, body composition and glucose metabolism during childhood in children born SGA in relation to their catch up growth in weight and in height.

Methods

Single centre cohort of 150 children (63 boys, 87 girls), identified from newborn records, at the Rosie Maternity Hospital in Cambridge, as being born full-term (37-42 weeks of gestational age) SGA (birth weight standard deviation scores (SDS) <-1.5) and assessed between the age of 4 and 7 years.

Data collected at study visits included:

- anthropometric parameters: height, weight, BMI, waist circumference - all transformed into age- and sex-adjusted SDS using UK growth standards
- lean and fat mass assessed by dual-energy x-ray absorptiometry
- systolic and diastolic blood pressure - transformed into age-, sex- and height-adjusted SDS
- fasting glucose and C-peptide

Children were stratified according to catch-up growth in:

- weight: defined as a difference in weight SDS between birth and study visit >0.67 SD
- height: defined as a height at study visit <-2 SD for age and sex

Results

Table 1. General characteristics of the study population

	All study population birth weight <-1.5 SD	Subgroup with birth weight <-2 SD
N	150	56
Males (%)	63 (42%)	31 (55%)
Birth weight (gr)	2485 ± 377	2267 ± 404
Birth weight SDS	-2.0 ± 0.5	-2.4 ± 0.5
Gestational age (weeks)	39.5 ± 1.8	39.2 ± 2.0
Age at study visit (years)	6.1 ± 0.8	6.3 ± 0.9
Height (cm)	113.9 ± 6.8	114.1 ± 7.3
Height SDS	-0.5 ± 0.9	-0.6 ± 1.0
Weight (cm)	19.6 ± 3.4	19.5 ± 3.0
Weight SDS	-0.6 ± 1.0	-0.8 ± 0.9
BMI (Kg/m ²)	15.0 ± 1.6	14.9 ± 1.3
BMI SDS	-0.5 ± 1.0	-0.5 ± 0.9
Waist circumference (cm)	51.5 ± 5.4	51.4 ± 6.0
Waist circumference SDS	-0.3 ± 1.3	-0.3 ± 1.5
Systolic blood pressure SDS	0.1 ± 0.7	0.1 ± 0.7
Diastolic blood pressure SDS	0.1 ± 0.6	0.1 ± 0.6

Data are means ± SD. BW: birth weight, SDS: standard deviation scores

Within this cohort of 150 children born SGA, at the time of assessment:

- **11 (7%) had a height <-2 SD:** 6 boys (9.5%) and 5 girls (5.7%)
- **6 (4%) had a height <-2.5 SD:** 2 boys (3.2%) and 4 girls (4.6%)

Results

Table 2. Comparisons between children with height <-2SD (Group 1) and those with height >-2SD (Group 2)

	Group 1 N 11	Group 2 N 139	P
Birth weight SDS	-2.3 ± 1.0	-2.0 ± 0.4	ns
Age (years)	6.5 ± 0.9	6.1 ± 0.8	ns
Weight SDS	-2.3 ± 0.8	-0.5 ± 0.9	<0.001
Height SDS	-2.6 ± 0.4	-0.3 ± 0.7	<0.001
BMI SDS	-0.6 ± 0.9	-0.5 ± 1.0	ns
Waist circumference SDS	-1.2 ± 0.9	-0.2 ± 1.3	0.02
Systolic blood pressure SDS	-0.1 ± 0.9	0.1 ± 0.7	ns
Diastolic blood pressure SDS	0.1 ± 0.8	0.1 ± 0.6	ns
Total Lean Mass (Kg)	12.3 ± 2.4	14.7 ± 2.2	0.01*
Total Fat Mass (Kg)	3.5 ± 0.9	4.0 ± 1.9	ns
Trunk Fat Mass (Kg)	1.1 ± 0.3	1.4 ± 0.9	ns
Limb Fat mass (Kg)	1.9 ± 0.5	2.2 ± 1.0	ns
Trunk-limb fat ratio	0.6 ± 0.1	0.6 ± 0.1	ns
Glucose (mmol/l)	4.5 ± 0.6	4.5 ± 0.4	ns
C-peptide (pmol/l)	268 ± 122	298 ± 117	ns

Data are means ± SD. ns: not significant. *Adjusted for height

Table 3. Comparisons between children with (Group 1) and without (Group 2) catch up growth in weight

	Group 1 N 122	Group 2 N 28	p
Males (%)	53 (43.4%)	10 (35.7%)	ns
Birth weight SDS	-2.0 ± 0.5	-1.9 ± 0.3	0.01
Age (years)	6.1 ± 0.8	6.1 ± 0.8	ns
Height SDS	-0.2 ± 0.8	-1.4 ± 0.9	<0.001
Weight SDS	-0.3 ± 0.9	-1.8 ± 0.6	<0.001
BMI SDS	-0.3 ± 1.0	-1.2 ± 0.6	<0.001
Waist circumference SDS	-0.1 ± 1.4	-1.2 ± 0.7	<0.001
Systolic blood pressure SDS	0.1 ± 0.7	-0.3 ± 0.6	0.009
Diastolic blood pressure SDS	0.1 ± 0.6	-0.1 ± 0.7	ns
Total Lean Mass (Kg)	14.9 ± 2.2	12.9 ± 1.9	<0.001*
Total Fat Mass (Kg)	4.2 ± 1.9	3.1 ± 1.0	0.01*
Trunk Fat Mass (Kg)	1.5 ± 0.9	1.0 ± 0.4	0.009*
Limb Fat mass (Kg)	2.3 ± 1.0	1.7 ± 0.5	<0.001*
Trunk-limb fat ratio	0.6 ± 0.1	0.5 ± 0.1	0.002*
Glycaemia (mmol/l)	4.5 ± 0.5	4.3 ± 0.5	0.03
C-peptide (pmol/l)	306 ± 116	258 ± 112	0.08

Data are means ± SD. ns: not significant. *Adjusted for height

Conclusions

- Within this cohort of children born SGA and measured in early childhood, 7% had a height <-2 SD.
- Those children who showed catch up in weight were relatively taller, had higher fat and lean mass, higher blood pressure and fasting glucose, whereas those children who did not show any catch up in height showed mainly reduced total lean mass without abnormal fasting glucose or blood pressure.

