

Aldosterone, renin, sodium and potassium excretion in normotensive prepubertal children

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Objetive

Previous studies have demonstrated that hypertension may begin early in the life. Under physiological conditions, the Renin-Angiotensin-Aldosterone System (RAAS) is highly variable due to variations in salt intake and other factors, making it difficult to interpret results. We measured aldosterone and renin and compared them with sodium and potassium excretion in a normotensive pre-pubertal population.

Subjects and methods

- A cross-sectional study was performed in 40 healthy normotensive children (23 females; 5.2 to 8.9 years old). Office blood pressure (BP) was measured in a seated position using an oscillometric device, according to international recommendations.
- Normal BP was defined as the mean of 3 determinations lower than the 90th percentile using international references. Systolic and diastolic BP indexes (SBPi and DBPi) are expressed as observed BP/50th percentile BP.
- Morning plasma aldosterone and renin were measured by immunoassay (DiaSorin), also electrolytes in serum as well in urine collected after discarding the first-morning sample were obtained.
- Sodium and potassium excretion was assessed by calculating: FENa ($100 \times (\text{urinary sodium} \times \text{serum creatinine}) \div (\text{serum sodium} \times \text{urinary creatinine})$), TTKG ($\text{urinary potassium} / \text{plasma osmolality} \div \text{serum potassium} / \text{urinary osmolality}$) and SUSPPUP ($\text{serum sodium} / \text{urinary sodium} \div \text{serum potassium}^2 / \text{urinary potassium}$).

Results

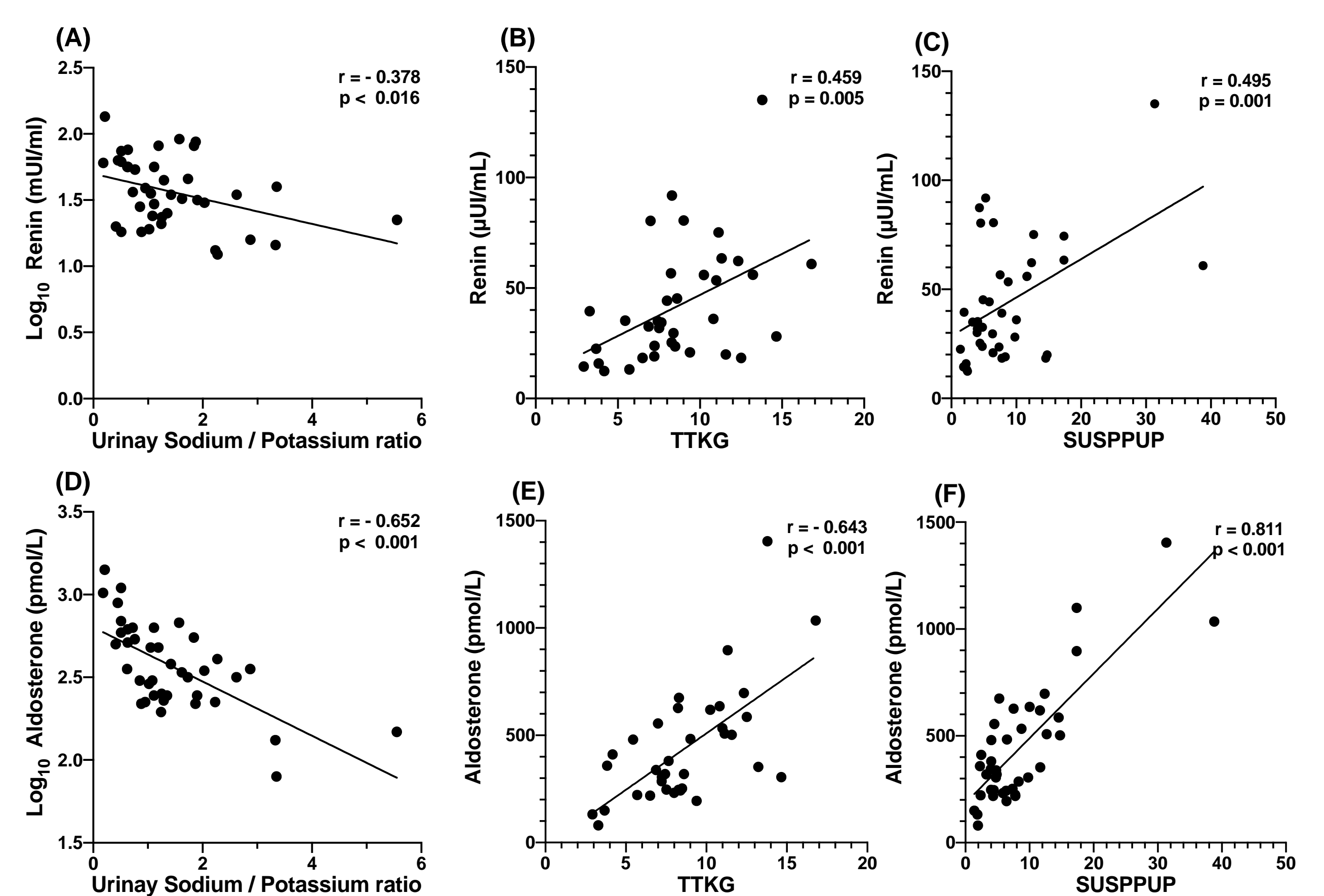
Table 1: Anthropometric and clinical characteristics of the selected pre-pubertal children

	Mean	SD	Median	Percentile 3rd	Percentile 97th
Age (years)	6.85	1.01	7.00	5.20	8.79
Height (SDS)	0.05	1.07	0.10	-2.23	2.24
BMI (percentile)	63.03	29.00	73.00	6.30	98.00
Abdominal P (cm)	58.92	7.75	56.50	48.23	78.77
Systolic BP (mmHg)	99.22	7.04	99.70	84.53	114.92
Systolic BP index	1.02	0.07	1.02	0.87	1.10
Diastolic BP (mmHg)	58.92	4.89	59.00	47.99	72.24
Diastolic BP index	1.03	0.09	1.02	0.82	1.20
Heart rate (per min)	90.18	12.04	89.17	71.48	126.54
Gest. age (weeks)	38.90	1.06	38.50	38.00	41.00
Birth weight (SDS)	0.44	0.78	0.46	-1.27	2.24

Table 2. Biochemical characteristics of the selected pre-pubertal children

	Mean	SD	Median	Percentile 3rd	Percentile 97th
Aldosterone (ng/dl)	15.95	10.14	12.55	3.31	48.07
Aldosterone (pmol/L)	442.67	281.39	348.22	91.85	1333.80
Renin (μUI/mL)	43.53	26.87	35.08	12.55	125.15
ARR (ng/dL)/(μUI/mL)	0.42	0.24	0.38	0.08	1.19
ARR (pmol/L)/(μUI/mL)	11.77	6.76	10.55	2.13	32.88
Serum Na (mmol/L)	140.13	2.10	140.00	136.00	144.00
Serum K (mmol/L)	4.45	0.39	4.35	3.92	5.59
Serum Cr (μmol/L)	0.04	0.01	0.03	0.02	0.05
FENa (%)	0.38	0.21	0.34	0.08	0.95
TTKG	8.68	3.30	8.28	2.96	16.55
Urinary Na/ K ratio	1.42	1.04	1.15	0.19	5.05
SUSPPUP	8.48	7.53	6.37	1.49	37.09
P Osm (mOsm/kg)	298.65	5.57	297.00	288.46	313.62
U Osm (mOsm/kg)	807.36	270.14	864.00	208.93	1251.29
Cortisol (nmol/L)	228.44	79.16	230.34	77.16	417.48

Figure 1: Correlation between electrolytes derivatives ratio with renin and aldosterone concentrations



Conclusion

- In a normotensive pediatric population, renin and aldosterone concentrations were highly associated with SUSPPUP, an equation where small changes in potassium levels are better represented.
- SUSPPUP could be a complement for an adequate interpretation of RAAS. It is necessary to demonstrate if SUSPPUP in pediatric subjects is also useful in RAAS related diseases.

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