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Circulating Insulin-like Growth Factor-I independently predicts blood pressure in apparently healthy children

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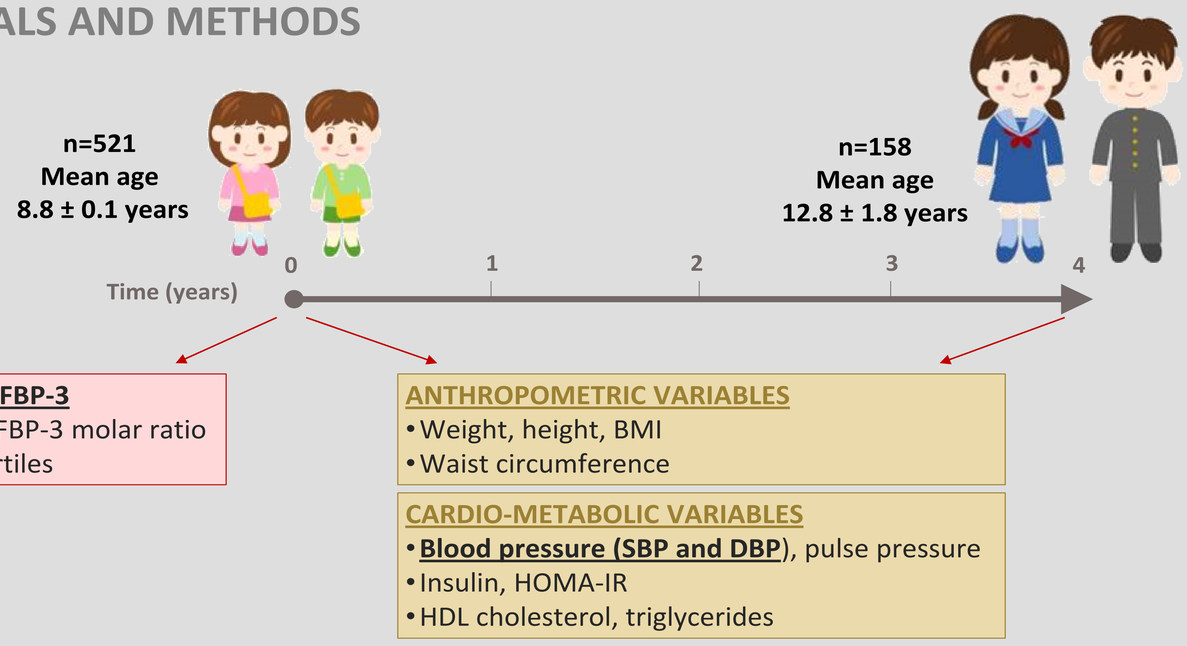
BACKGROUND

- **Discordant associations** between **IGF-I and blood** pressure exist, with scarce reports in apparently healthy children.
- **IGF-I**, together with **calcium and phosphorus**, are involved in bone metabolism and vascular health.

OBJECTIVES

To study the **association** between IGF-I serum levels and blood pressure in **children**, together with the **interaction** of the serum **calcium-phosphorus product** (Ca*P) in this association.

MATERIALS AND METHODS



RESULTS

1. IGF-I and IGF-I/IGFBP-3 molar ratio associate with a worse cardio-metabolic profile

- Correlation coefficients between IGF-I with SBP, DBP and pulse pressure are higher with increasing Ca*P levels.

Table 1. Pearson correlation coefficients for IGF-I and IGF-I/IGFBP-3 with selected variables.

	IGF-I				IGF-I/IGFBP-3			
	All	Ca*P tertiles			All	Ca*P tertiles		
BASELINE	(n=521)	≤46.0 (n=180)	46.0-50.4 (n=166)	≥50.4 (n=175)	(n=521)	≤46.0 (n=180)	46.0-50.4 (n=166)	≥50.4 (n=175)
Age	0.528***	0.611***	0.413***	0.608***	0.442***	0.515***	0.339***	0.508***
Height	0.603***	0.663***	0.569***	0.621***	0.486***	0.558***	0.441***	0.490***
BMI	0.404***	0.454***	0.393***	0.393***	0.280***	0.346***	0.252***	0.258***
Waist	0.432***	0.480***	0.403***	0.444***	0.294***	0.350***	0.260***	0.295***
SBP	0.328***	0.261***	0.343***	0.420***	0.248***	0.174*	0.235**	0.361***
DBP	0.199***	0.148*	0.198*	0.266***	0.141***	0.116	0.086	0.219**
Pulse pressure	0.203***	0.180*	0.189*	0.276***	0.184***	0.232**	0.120	0.214**
Insulin	0.443***	0.520***	0.391***	0.420***	0.313***	0.420***	0.253***	0.263***
HOMA-IR	0.448***	0.529***	0.389***	0.429***	0.318***	0.426***	0.252***	0.273***
HDL cholesterol	-0.148***	-0.059	-0.199**	-0.200**	-0.081	-0.005	-0.106	-0.145
Triglycerides	0.253***	0.228**	0.225**	0.306***	0.138**	0.131	0.075	0.198**
FOLLOW-UP	n=158	n=44	n=61	n=53	n=158	n=44	n=61	n=53
Age	0.536***	0.540***	0.401***	0.692***	0.573***	0.481***	0.482***	0.713***
Height	0.468***	0.480***	0.417***	0.556***	0.545***	0.478***	0.510***	0.635***
BMI	0.434***	0.238	0.532***	0.578***	0.429***	0.263	0.503***	0.509***
Waist	0.411***	0.228	0.479***	0.559***	0.428***	0.239	0.494***	0.517***
SBP	0.454***	0.238	0.441***	0.625***	0.505***	0.414**	0.490***	0.583***
DBP	0.157*	-0.076	0.113	0.394**	0.147	-0.065	0.177	0.253
Pulse pressure	0.365***	0.300*	0.335**	0.460***	0.436***	0.518***	0.343**	0.474***
Insulin	0.286***	0.035	0.456***	0.367**	0.347***	0.056	0.498***	0.415**
HOMA-IR	0.504***	0.496***	0.541***	0.549***	0.341***	0.332*	0.412***	0.394***
HDL cholesterol	-0.231**	-0.150	-0.316*	-0.260	-0.105	-0.070	-0.190	-0.130
Triglycerides	0.205**	0.052	0.333**	0.205	0.198*	0.066	0.273*	0.205

2. Associations of IGF-I and IGF-I/IGFBP-3 molar ratio with SBP are stronger in children with the highest Ca*P

Table 2. ANCOVA analysis to study the interaction of Ca*P in the association between IGF-I or IGF-I/IGFBP-3 and SBP.

Ca*P x IGF-I	Baseline SBP (n=521)		Follow-up SBP (n=158)	
	F	p-value	F	p-value
Ca*P	6.74	0.010**	1.96	0.164
IGF-I	1.91	0.168	0.24	0.627
Ca*P x IGF-I	**5.42**	**0.020***	1.44	0.232
Ca*P x IGF-I/IGFBP-3	**Baseline SBP (n=521)**		**Follow-up SBP (n=158)**	
	F	p-value	F	p-value
Ca*P	3.01	0.083	1.46	0.229
IGF-I/IGFBP-3	2.74	0.099	1.45	0.230
Ca*P x IGF-I/IGFBP-3	**5.47**	**0.020***	2.80	0.096

3. IGF-I and IGF-I/IGFBP-3 molar ratio remain associated with SBP after adjusting for confounding variables

Table 3. Multivariate linear regression analyses of SBP as dependent and IGF-I as independent variables.

Baseline SBP	All (n=521)		Ca*P tertiles ≤46.0 (n=180)		46.0-50.4 (n=166)		≥50.4 (n=175)	
	β	p	β	p	β	p	β	p
Age	0.180	0.001	-	ns	-	ns	0.293	0.003
BMI	0.316	<0.001	0.397	<0.0001	0.415	<0.0001	-	ns
IGF-I	0.100	0.046	-	ns	0.191	0.022	0.245	0.009
R^2		0.252		0.250		0.302		0.246

Non-predictive variables: sex and puberty.

Follow-up SBP	All (n=158)		Ca*P tertiles ≤46.0 (n=44)		46.0-50.4 (n=61)		≥50.4 (n=53)	
	β	p	β	p	β	p	β	p
Sex	-0.138	0.024	-	ns	-	ns	-0.254	0.021
Puberty	0.246	0.003	-	ns	-	ns	0.352	0.019
BMI	0.421	<0.001	0.555	<0.0001	0.402	0.001	-	ns
IGF-I	-	ns	-	ns	-	ns	0.381	0.013
R^2		0.538		0.529		0.472		0.566

Non-predictive variables: age.

Table 4. Multivariate linear regression analyses of SBP as dependent and IGF-I/IGFBP3 as independent variables.

Baseline SBP	All (n=521)		Ca*P tertiles ≤46.0 (n=180)		46.0-50.4 (n=166)		≥50.4 (n=175)	
	β	p	β	p	β	p	β	p
Age	0.198	<0.0001	-	ns	-	ns	0.322	<0.0001
Puberty	-	ns	0.155	0.042	-	ns	-	ns
BMI	0.329	<0.0001	0.393	<0.0001	0.446	<0.0001	0.178	0.022
IGF-I / IGFBP-3	-	ns	-	ns	-	ns	0.210	0.015
R^2		0.248		0.255		0.289		0.241

Non-predictive variables: sex.

Follow-up SBP	All (n=158)		Ca*P tertiles ≤46.0 (n=44)		46.0-50.4 (n=61)		≥50.4 (n=53)	
	β	p	β	p	β	p	β	p
Age	0.172	0.050	-	ns	-	ns	-	ns
Sex	-0.130	0.036	-	ns	-	ns	-0.235	0.035
Puberty	0.253	0.003	-	ns	0.293	0.042	0.360	0.020
BMI	0.437	<0.0001	0.543	<0.0001	0.417	0.001	0.285	0.024
IGF-I / IGFBP-3	-	ns	-	ns	-	ns	0.260	0.041
R^2		0.532		0.544		0.472		0.546

CONCLUSIONS

Our results suggest that IGF-I is an independent predictor of SBP in healthy children, specially in those with high Ca*P levels.