The overweight and obesity decrease the growth potential in Mexican children and adolescents

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BACKGROUND

The bone age (BA) assess the skeletal maturity and determine the children linear growth. Mexican children have a slightly delay in skeletal maturity before 10 years, but they reach in mean a BA 1 year in advance at the end of the puberty.[1] On the other hand, Mexico has a high prevalence of childhood obesity[2] and the adiposity has been associated with the BA advance in other populations.[3]

Automated BA minus chronological age (CA) of Mexican children
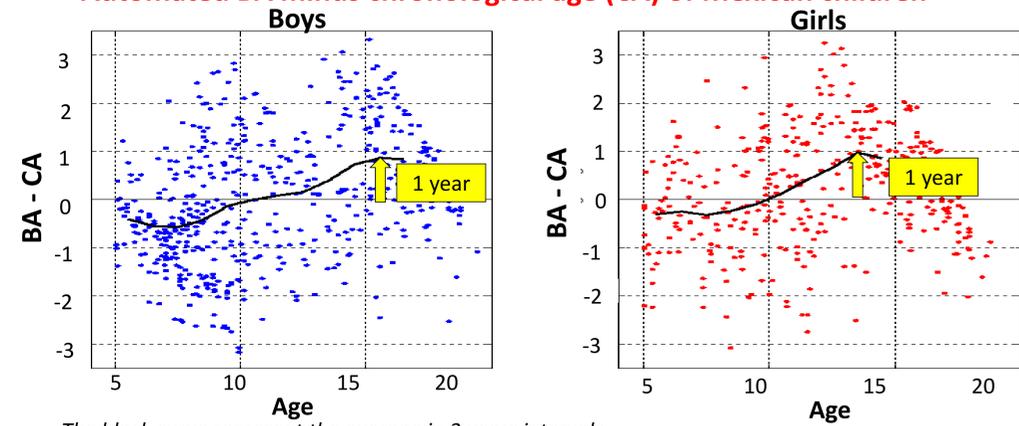
The black curve represent the average in 3 years intervals.

Prevalence of overweight and obesity in Mexico[2]

3-5 years old
6-11 years old
12-19 years old
>20 years old

● Overweight/obesity   ● Eutrophics
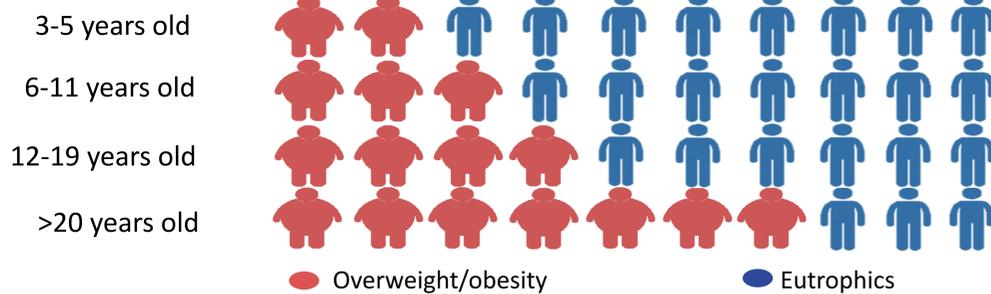
AIM

To compare the skeletal maturation of Mexican children and adolescents according to nutritional status; and to analyze the effect of the body mass index (BMI) changes on BA acceleration and the adult height prediction.

METHODS

☐ Cross-sectional study; n=915 healthy children of Mexico City's Metropolitan area (range 5 to 19 years). The anthropometric measures of participants and their parents were obtained by trained staff. A hand PA radiography was taken and analyzed using BoneXpert software to determine automated BA and the adult height prediction (AHP). We constructed the BA curves with the average of the difference between BA and chronological age (CA) as function of CA by gender. We compare the curves of BA according to nutritional status:

✓ BMI: 10th-84th percentile vs ≥85th percentile.
✓ WHtR: <0.5 vs 0.5.

☐ In the second phase we follow-up 56 children for 1 year (9 to 11 years old). We analyzed the impact of Z-score of BMI (ZBMI) on BA progression, growth velocity and Z-score of height (ZHt).

☐ Local Committee Approval: HIM 2017/058/SSA1344.
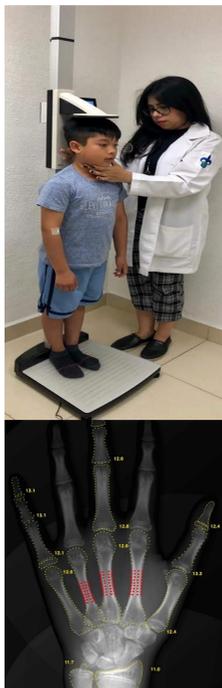
RESULTS

Characteristics of the participants

	Cross sectional phase n=985		Follow-up phase n=56	
Men n (%)	525	(57.8)	30	(53.5)
Age (years)*	11.5 ± 3.9		10.2 ± 0.8	
BA (years)*	11.6 ± 4.3		10.6 ± 1.3	
Pre-pubertals n (%)	435	(47.9)	40	(71.4)
Height (cm)*	143 ± 19.8		138 ± 13.8	
Waist circumference (cm)	67.5 ± 12.4		64.5 ± 10.3	
WHtR ≥ 0.5 cm (%)	250	(27.5)	250	(27.5)
BMI (kg/m²)	19.7 ± 4.6		19.7 ± 4.6	
Overweight/obesity n (%)	335	(36.9)	335	(36.9)

* Mean ± standard deviation. BA: bone age, WHtR: waist to height ratio, BMI: Body mass index.

RESULTS

Automated BA minus age according to BMI classification

< 85th pc   ≥ 85th pc

< 85th pc   ≥ 85th pc
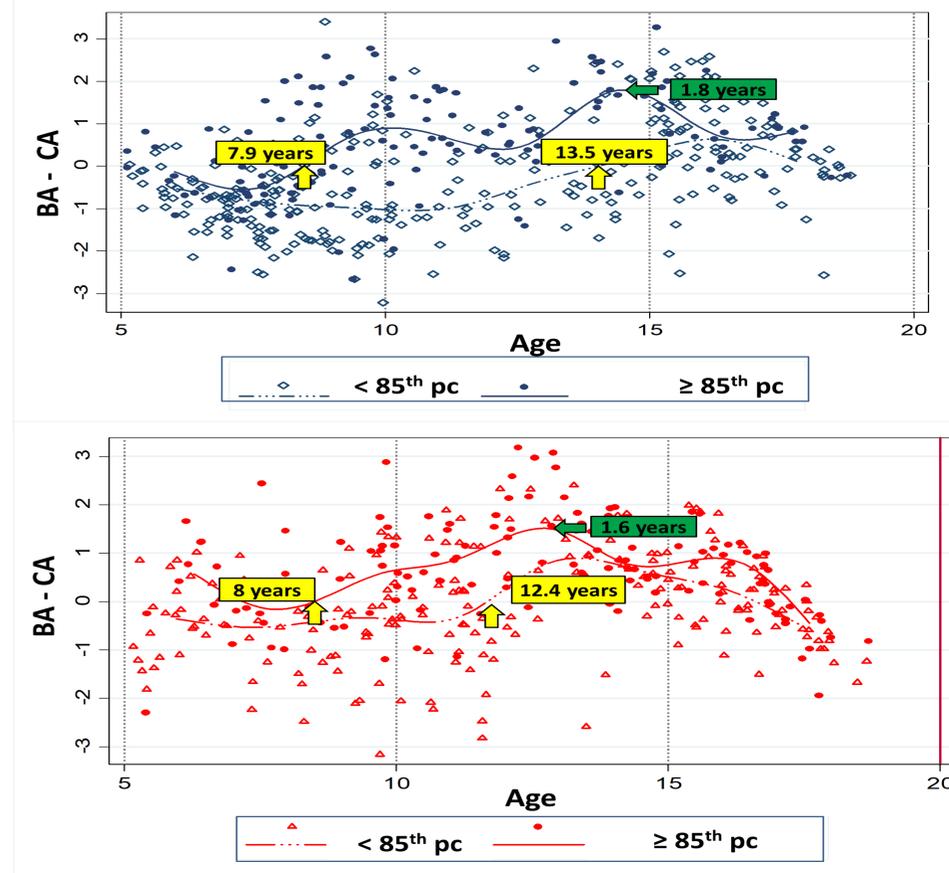
Automated BA minus age according to WHtR classification

<0.5 WHtR   ≥0.5 WHtR

<0.5 WHtR   ≥0.5 WHtR
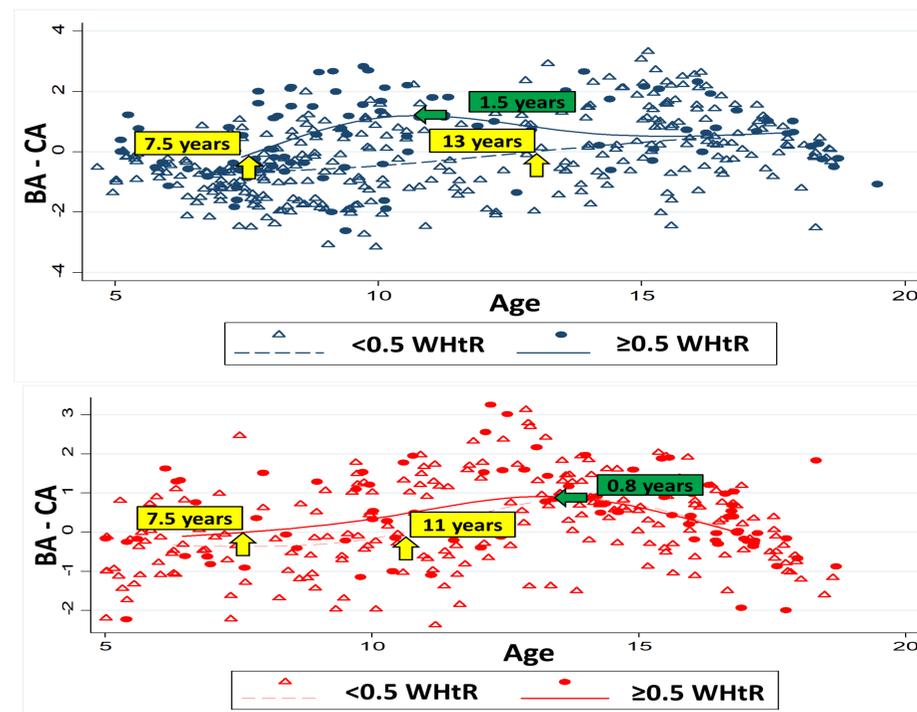
1-year follow up phase (preliminary results)

	↑ ≥+1 ZBMI n=28		ZBMI <+1 to -1 n=28		
	Mean	SD	Mean	SD	p
GV (cm/year)	6.50	± 1.07	6.35	± 0.99	0.693
BA advance in 1 year	**1.36**	**± 0.61**	**0.88**	**± 0.54**	**0.025***
Δ AHP (cm)	**-0.94**	**± 2.20**	**1.15**	**± 0.93**	**0.002***
Δ Z-Height	0.13	± 0.20	0.18	± 0.18	0.413

Linear regression coefficients and 95% CIs for ZBMI			
	β	95% CIs	p
AHP (cm)	-1.42	-2.40 -0.44	**0.005**
BA-CA (years)	0.32	0.07 0.56	**0.011**
Z-Height	0.22	-0.81 1.27	**0.666**

GV: growth velocity, AHP: adult height prediction, BA: bone age, CA: chronological age, CIS: confidence intervals.

CONCLUSIONS

Mexican children and adolescents with overweight and obesity have BA acceleration at younger age in comparison with eutrophic children. The increase in the Z-score of BMI reduce the growth potential in the late childhood and puberty.

REFERENCES. [1]. Miranda LA, et.al. *Horm Res Paediatr 2018;90(suppl 2):1–71.* [2]. National Health and Nutrition Survey 2016. [3]. Phinas HO, et, al. Endocr Pract. 2014; 62-67.

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Bone, growth plate and mineral metabolism
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