

# Cardiometabolic risk factors in overweight/obese children and adolescents and family history of cardiovascular disease

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## Introduction

Global prevalence of childhood obesity has increased from 4.2% to 6.7% in recent decades. Dyslipidaemia predisposes to cardiovascular disease (CVD) in adults. Family history (FH) of CVD is used as a screening tool for dyslipidaemia in children/adolescents, however with controversial sensitivity.

## Objectives

Purpose of the study was to identify and examine the effects of possible cardiovascular (CV) risk factors in overweight / obese (OW/O) and normal weight (NW) children/adolescents with FH of CVD.

## Methods

Anthropometrical, biochemical indices (tabl. 1), FH of CVD were obtained from 68 healthy children/adolescents aged 7-13 years old. SPSS software was used for statistical analysis

## Results

35/68 were OW/O, 33 were NW. 15/35 OW/O and 8/33 NW had positive FH of CVD. Systolic blood pressure (SBP), waist circumference (WC), triglycerides (Tg), hsCRP, fasting blood insulin (FBI) and HOMA-IR were found statistically significantly higher in the OW/O group compared to the NW one. High density lipoprotein (HDL-C), apolipoprotein A (Apo(A)) were statistically significantly lower in the OW/O children/adolescents compared to their normal peers. Paradoxically, total Cholesterol (TCh) was statistically significantly higher in the NW children/adolescents. FBI, hsCRP levels and WC were significantly higher in the OW/O children/adolescents with FH of CVD compared to the ones without. Figure 1 depicts the strong positive relation of fasting blood insulin with HOMA-IR,  $r=0.998$ ,  $p<0.001$ . There was significant difference in WC between OW/O with positive or negative FH CVD ( $p=0.015$ ) (fig. 2). No difference was found between OW/O and NW groups in low density lipoprotein (LDL-C), fasting glucose, apolipoprotein B (Apo(B)) and diastolic blood pressure (DBP). TCh and SBP were found to be independently associated with obesity (negatively,  $OR=1.965(1.935, 2.97)$ ,  $p<0.031$  and positively  $OR=1.045(1.016, 1.074)$ ,  $p<0.002$ , respectively). FH of CVD was not related to any CV risk factors (Tabl. 2). There was a trend that controls have breastfed longer and their parents had lower BMI values. In a univariate logistic regression model, none of the cardiovascular risk factors (RF) were related to children with and without family history of CVD (tabl. 3).

**Table 1.** Basic characteristics between boys and girls (n=68)

	Mean $\pm$ SD		p-value
	Boys (N=28)	Girls (N=40)	
Age (y)	9.78 $\pm$ 3.48	9.48 $\pm$ 2.71	0.684
Height (cm)	1.41 $\pm$ 0.19	1.39 $\pm$ 0.15	0.479
Weight (kg) <sup>a</sup>	50.2 $\pm$ 26.4	43 $\pm$ 21.9	0.223
BMI (kg/m <sup>2</sup> ) <sup>a</sup>	23.6 $\pm$ 7.74	21.2 $\pm$ 6.6	0.182
SBP (mmHg)	59.7 $\pm$ 7.8	50.3 $\pm$ 29.2	0.185
SBP (mmHg)	57.3 $\pm$ 8.8	49.2 $\pm$ 25.4	0.224
TCh (mg/dl) <sup>a</sup>	162.4 $\pm$ 45.5	162.8 $\pm$ 29.7	0.974
TG (mg/dl) <sup>a</sup>	78.5 $\pm$ 39.5	83.9 $\pm$ 45	0.605
HDL (mg/dl) <sup>a</sup>	48.3 $\pm$ 14.7	52.3 $\pm$ 16.8	0.307
LDL (mg/dl)	92 $\pm$ 24.1	95 $\pm$ 22.8	0.543
ApoA (mg/dl)	133.5 $\pm$ 30	140.3 $\pm$ 27.1	0.330
ApoB (mg/dl) <sup>a</sup>	69.9 $\pm$ 22.2	63.6 $\pm$ 15.1	0.165

P<0.05, <sup>a</sup>Man Whitney test- all other t-test

**Table 2.** Comparison of normal and obese group with and without FH CVD

Variables	Normal			Obese		
	PFH (n=8)	NFH (n=25)	Total (n=33)	PFH (n=15)	NFH (n=20)	Total (n=35)
SBP	54 $\pm$ 23.9	38.9 $\pm$ 26.6	42.5 $\pm$ 26.4	68.5 $\pm$ 24.9	63.2 $\pm$ 28.2	65.5 $\pm$ 26.6*
DBP	47.5 $\pm$ 30.1	51.2 $\pm$ 30.4	50.3 $\pm$ 29.9	53.3 $\pm$ 29.9	56 $\pm$ 19.9	54.9 $\pm$ 24.3
TC	167 $\pm$ 33	166 $\pm$ 30	167 $\pm$ 31	138 $\pm$ 18	161 $\pm$ 24	151 $\pm$ 24.5*
TG	59.5 $\pm$ 22.5	73.8 $\pm$ 42.2	70.4 $\pm$ 38.7	88 $\pm$ 44.5	95.9 $\pm$ 44.2	92.5 $\pm$ 43.8*
HDL	64.9 $\pm$ 19.3	54.4 $\pm$ 17.5	56.9 $\pm$ 18.2	41.9 $\pm$ 10	46.5 $\pm$ 10.6	44.5 $\pm$ 10.5*
LDL	90.8 $\pm$ 29.5	104.7 $\pm$ 43.4	101.4 $\pm$ 40.6	82.4 $\pm$ 21	95.5 $\pm$ 23	89.9 $\pm$ 22.9
Apo (A)	159.9 $\pm$ 25	141 $\pm$ 31.6	145.6 $\pm$ 31	121 $\pm$ 23.6**	135.4 $\pm$ 21.8	129 $\pm$ 23.3*
Apo (B)	61 $\pm$ 15.6	67.3 $\pm$ 19.3	65.9 $\pm$ 18.5	66.6 $\pm$ 22.8	66.7 $\pm$ 15.9	66.7 $\pm$ 18.9
Lp(a) <sup>a</sup>	20(3.4, 113.9)	21.2(2,200)	21.2(2, 200)	16.5(4.1, 106)	16.5(4.4, 87)	16.5(4.1, 106)
hs CRP <sup>a</sup>	0.11(0.01, 2.54)	0.08(0.01, 2.6)	0.08(0.01, 2.6)	0.73(0.03, 2.8)	0.78(0.02, 2.7)	0.75(0.02, 2.8)*
FBG	84.4 $\pm$ 12	88 $\pm$ 7.7	87 $\pm$ 8.9	87 $\pm$ 8.7	89.5 $\pm$ 8	88.4 $\pm$ 8.4
FBI <sup>a</sup>	6.6(1.1, 35.6)	8.6(2.9, 159)	8.2(1.1, 159)	16(4.5, 42)**	11.8(0.2, 31)	12.8(0.2, 42)*
HOMA-IR <sup>b</sup>	0.95X2.28	1.06X1.68	1.03X1.81	1.8X1.9	1.43X1.77	1.58X1.83*
	(0.35, 4.35)	(0.38, 3.24)	(0.35, 4.35)	(0.58, 5.24)	(0.37, 3.83)	(0.37, 5.24)

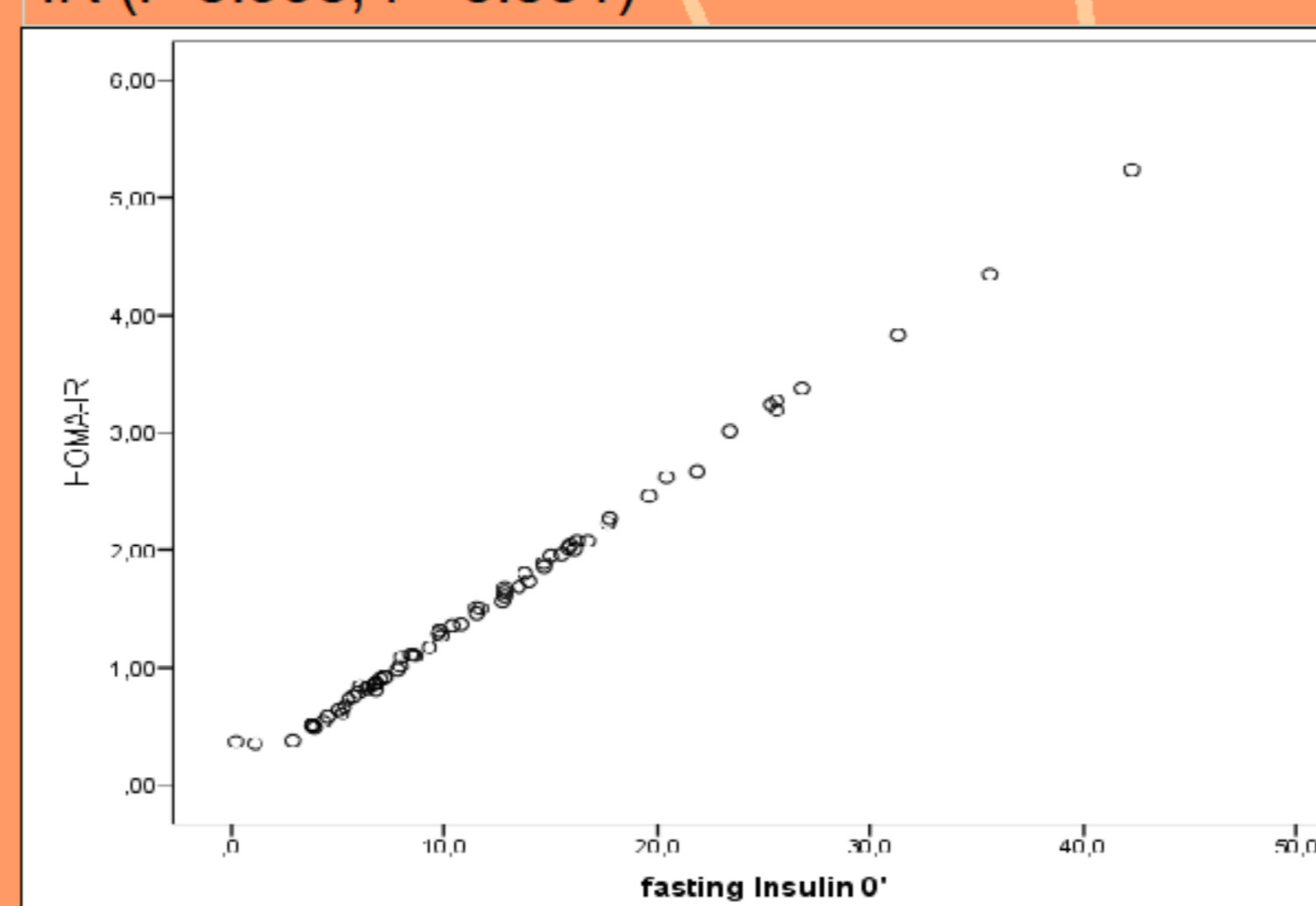
P<0.05 <sup>a</sup> Distribution not normal (median, min-max), <sup>b</sup>data presented as log (Geometric mean\*Geometric SD)

\*Statistically significantly difference between obese and normal group \*\*Statistically significantly difference between obese and normal group with PFH

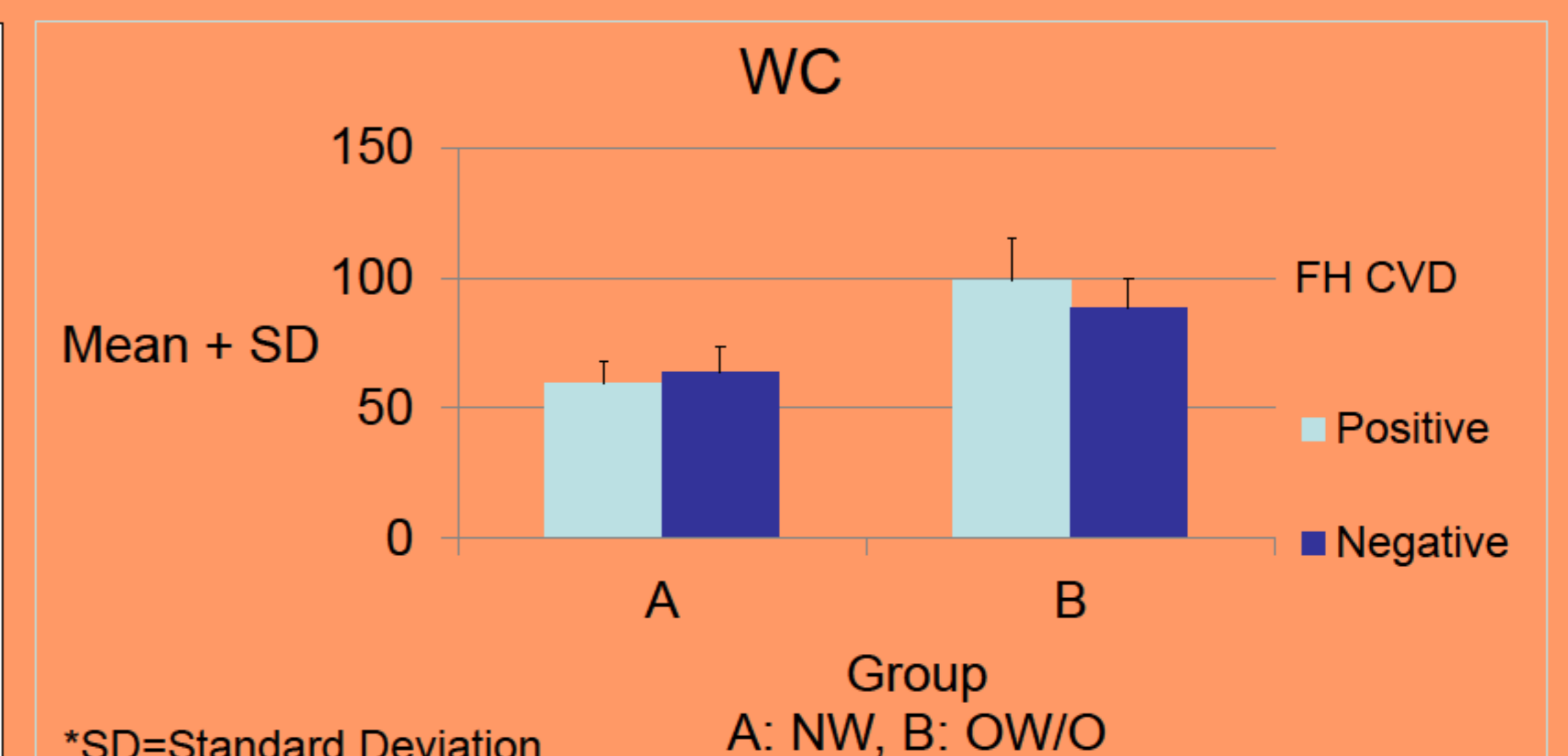
**Table 3.** Univariate logistic regression analysis between cardiometabolic RF and family history of CVD,

	Univariate logistic regression results*				Sensitivity/ Specificity
	OR	95% CI Lower - Upper	p-value		
SBP (mmHg)	1.018	.999 1.037	0.064	0.13/0.93	
TC (mg/dl)	1.983	1.965 2.001	0.070	0.13/0.96	
TG (mg/dl)	0.997	0.985 1.009	0.624	0.00/1.00	
HDL (mg/dl)	0.996	0.965 1.028	0.801	0.00/1.00	
Apo(A) (mg/dl)	0.995	0.978 1.013	0.603	0.00/1.00	
hsCRP	1.367	0.689 2.715	0.371	0.00/1.00	
FBI (mIU/ml)	1.058	0.993 1.127	0.080	0.17/0.94	
HOMA-IR	1.570	0.941 2.619	0.084	0.17/0.94	

**Figure 1.** fasting insulin relationship to HOMA-IR ( $r=0.998$ ,  $P<0.001$ )



**Figure 2.** WC, group and FH CVD



## Conclusions

Dyslipidaemia, insulin resistance, elevated SBP and increased WC appear in OW/O children/adolescents. Using a FH of CVD to screen for dyslipidaemia misses a significant percentage (30-60%) of children with dyslipidaemia. Universal screening of lipid profiles in children is recommended. Preventing obesity can lead to lower CV risk in children/adolescents.

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