The bilirubin/triglycerides ratio predicts changes over time in glycated hemoglobin in healthy children

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INTRODUCTION

Low serum bilirubin and high serum triglycerides are independently associated with higher risk of developing metabolic syndrome. Both bilirubin and triglycerides can regulate insulin secretion and glucose uptake. This is a first longitudinal study in healthy children to associate bilirubin and the bilirubin/triglycerides ratio with metabolic markers.

OBJECTIVES

Analyze independent associations between bilirubin and the bilirubin/triglycerides ratio with insulin secretion and resistance and HbA1c in a cohort of healthy children.

SUBJECTS/METHODS

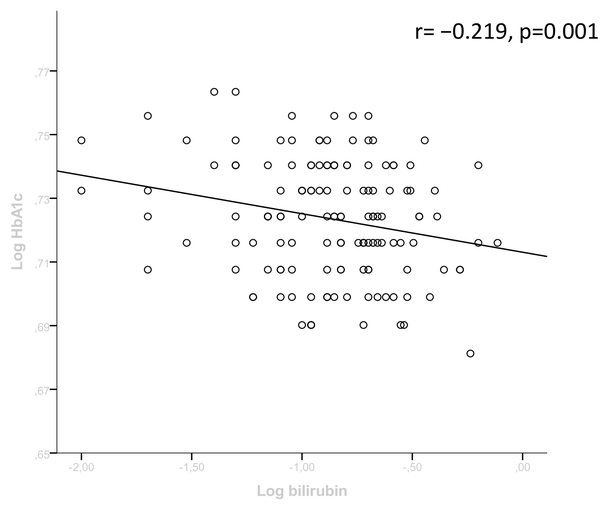
A cohort of 246 apparently healthy children (mean age 8,8 ± 0,1 years) was studied. Of those, 142 (58%) were reevaluated 4 years later (mean age 12,9 ± 1,8 years). Anthropometric (BMI, waist) and metabolic parameters (total bilirubin, triglycerides, glucose, insulin, HOMA-IR, HOMA-β and HbA1c in fasting blood samples) were assessed. Both bivariate correlations and independent associations by means of multiple linear regression analyses were performed.

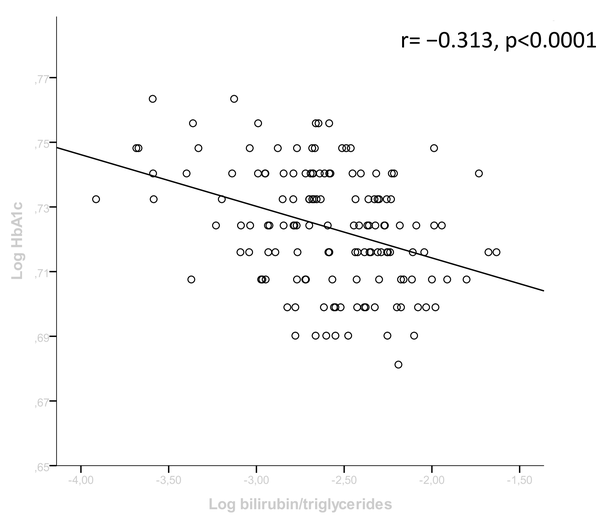
RESULTS

Total bilirubin was not associated with either HOMA-IR or HOMA-β, but it was independently associated with HbA1c, both at baseline (β= −0.210; p=0.001; R^2=3.3%) and at follow-up (β= −0.269; p=0.001; R^2=6.6%). Stronger independent associations were found between the bilirubin/triglycerides ratio and HbA1c, both at baseline (β= −0.294; p<0.0001; R^2= 9.4%) and at follow-up (β= −0.253; p=0.002; R^2=8.8%).

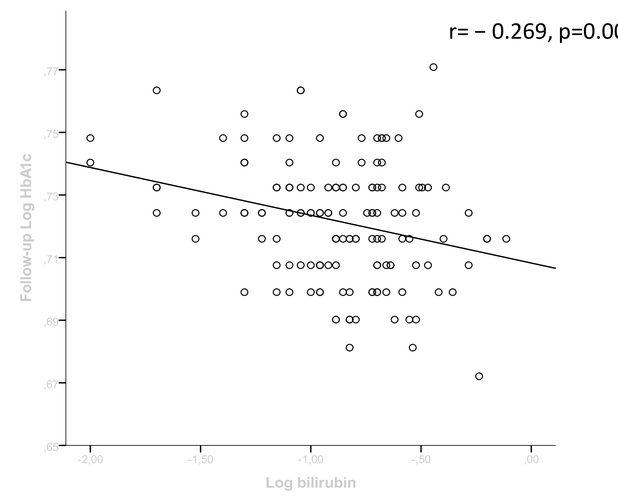
	Baseline (n=246)	Follow-up (n=142)
Clinical Assessments		
Age (years)	8.8 ± 0.1	12.9 ± 0.1
Gender (%F)	47%	48%
Puberty (%≥S2)	17%	70%
Weight (Kg)	41 ± 1	59 ± 2
Weight (SDS)	1.20 ± 0.11	0.78 ± 0.12
Height (cm)	137 ± 1	159 ± 1
Height-SDS	0.76 ± 0.07	0.45 ± 0.09
BMI (kg/m^2)	21.3 ± 0.3	22.9 ± 0.5
BMI-SDS	1.03 ± 0.10	0.67 ± 0.13
Waist (cm)	70 ±1	77 ± 1
SBP (mmHg)	109 ± 1	115 ± 1
DBP (mmHg)	63±1	63 ± 1
Laboratory Assessments		
Bilirubin total (mg/dl)	0.13 (0.08-0.20)	-
Triglycerides (mg/dl)	54 (40-78)	-
Ratio bilirubin/triglycerides	0.002 (0.001-0.004)	-
Glucose (mg/dl)	86 (83-91)	87 (81-91)
Insulin (mIU/L)	5.3 (2.2-9.7)	9.9 (7.0-14.3)
HbA1c (%)	5.3 (5.1-5.5)	5.3 (5.1-5.4)
HOMA-IR	1.2 (0.4-2.1)	2.2 (1.5-3.1)

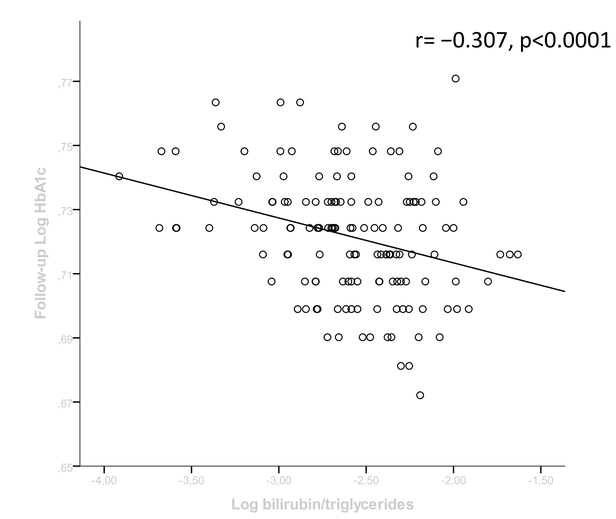
Follow-up





Baseline





MULTIVARIATE LINEAR MODELS

Baseline Log HbA1C as dependent variable

	Beta	Sig.	R^2
Baseline Log bilirubin	-0.210	0.001	**3.3**
BMI	0.171	0.015	7.3
Age	0.167	0.017	1.7
Total R^2			12.3
Baseline Log bilirubin/triglycerides	-0.294	<0.0001	**9.4**
BMI	--	--	--
Age	0.216	<0.0001	4.3
Total R^2			13.7

Non-predictive variables all subjects: sex, puberty, waist., HOMA-IR.

Follow-up HbA1C as dependent variable

	Beta	Sig.	R^2
Baseline Log Bilirubin	-0.269	0.001	**6.6**
BMI	--	--	--
Age	--	--	--
Total R^2			6.6
Baseline Log bilirubin/triglycerides	-0.253	0.002	**8.8**
BMI	0.252	0.008	3.8
Age	-0.282	0.002	2
Total R^2			14.6

Non-predictive variables all subjects: sex, puberty, waist., HOMA-IR.

CONCLUSIONS

Bilirubin and specifically the bilirubin/triglycerides ratio is in healthy children independently associated with HbA1c.
Our results indicate that the bilirubin/triglycerides ratio predicts changes in glucose tolerance over time in healthy children.