FACTORS ASSOCIATED WITH DYSLIPIDEMIA IN PATIENTS WITH TYPE 1 DIABETES: A SINGLE-CENTER EXPERIENCE

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BACKGROUND

Youth with type 1 diabetes (T1D) may have altered lipid profiles and evidence of subclinical cardiovascular disease (CVD) within the first decade of diagnosis.
Co-occurrence of multiple risk factors for CVD (overweight, hypertension, dyslipidemia and family history of CVD) contributes to the susceptibility of T1D patients to develop atherosclerosis.
Dyslipidemia is a modifiable factor that may contribute to CVD.

AIMS

- To assess factors associated with dyslipidemia in young subjects with T1D
- To describe the progression of multiple cardiovascular disease risk factors

STUDY DESIGN, SUBJECTS & METHODS

Study design: Cross-sectional and longitudinal cohort study
Setting: National Center for Childhood Diabetes, Schneider Children's Medical Center of Israel
Subjects: 170 young subjects with T1D
Methods:
- Medical chart review
- Structured telephone interview in 2016: to update the family history for type 2 diabetes, CVD, hypertension, dyslipidemia

RESULTS

CHARACTERISTICS OF STUDY COHORT AT FIRST EVALUATION

	All n = 170	Males n = 86	Females n = 84	P
Age (y)	12.1 ± 4.7	12.0 ± 5.1	12.2 ± 4.2	0.854
Age at diabetes diagnosis	8.1 ± 4.4	8.0 ± 4.7	8.2 ± 4.1	0.735
Diabetes duration	4.4 ± 4.0	4.4 ± 4.2	4.3 ± 3.8	0.828
HbA1c (%)	8.4 ± 1.4	8.6 ± 1.4	8.2 ± 1.4	0.064
Pubertal stage				
Tanner 1	79 (46.5)	47 (54.7)	32 (38.1)	
Tanner 2	11 (6.5)	4 (4.7)	7 (8.3)	
Tanner 3	19 (11.2)	8 (9.3)	11 (13.1)	0.291
Tanner 4	12 (7.1)	5 (5.8)	7 (8.3)	
Tanner 5	49 (28.8)	22 (25.6)	27 (32.1)	
Weight status				
Overweight	20 (11.8)	4 (4.7)	11 (13.1)	0.864
Obesity	8 (4.7)	8 (9.3)	4 (4.8)	
Blood pressure (centiles)				
Pre-hypertension	15 (8.8)	9 (10.5)	6 (7.1)	
Stage 1 hypertension	23 (13.5)	12 (14)	11 (13.1)	0.426
Stage 2 hypertension	9 (5.3)	6 (7)	3 (3.6)	
Lipid profile (centiles)	n = 144	n=71	n = 73	
LDL-c				
< 75th	63 (43.8)	27 (38)	36 (49.3)	
75th-90th	47 (32.6)	21 (29.6)	26 (35.6)	**0.049**
borderline elevated 90-95th	10 (6.9)	7 (8.1)	3 (4.1)	
elevated > 95th	24 (16.7)	16 (18.6)	8 (11)	
Triglycerides				
< 75th	31 (21.5)	12 (16.9)	19 (26)	
75th-90th	59 (41)	30 (42.3)	29 (39.7)	0.393
borderline elevated 90-95th	16 (11.1)	7 (9.9)	9 (12.3)	
elevated > 95th	38 (26.3)	22 (30.9)	16 (21.9)	
HDL-c				
normal level > 10th	127 (88.2)	62 (87.3)	65 (89%)	
Borderline low 5th-10th	9 (6.2)	4 (5.6)	5 (6.8)	0.728
Low level < 5th	8 (5.5)	5 (6.9)	3 (4.1)	

Data is presented as mean ± SD or number (percent). BMI values were converted to sex- and age- specific percentiles (CDC 2000). Overweight, ≥85th to <95th percentiles; and obese, ≥95th percentile
Blood pressure levels were converted to sex-, age- and height- specific percentiles (NHBPEP 4th report)
Pre-HTN systolic and/or diastolic ≥ 90th-95th , Stage 1 HTN systolic and/or diastolic ≥ 95th < 99th, Stage 2 HTN systolic and/or diastolic ≥99th.
Comparison between sexes were analyzed by independent sample t- or chi-square tests.

CHARACTERISTICS OF STUDY COHORT (LAST VISIT)

	All n = 170	Males n = 86	Females n = 84	P
Age (y)	26.3 ± 5.7	26.5 ± 6.0	26.0 ± 5.5	0.540
Diabetes duration (y)	18.2 ± 5.6	18.6 ± 5.5	17.8 ± 5.8	0.375
Overweight/Obesity	63 (39.9)	32 (40)	31 (39.7)	0.974
Hypertension	37 (24.3)	26 (35.1)	11 (14.1)	**0.003**
Systolic BP > 130 mmHg	28 (18.4)	22 (29.7)	6 (7.7)	**<0.001**
Diastolic BP > 80 mmHg	21 (13.8)	16 (21.6)	5 (6.4)	**0.007**
Dyslipidemia	113 (66.5)	57 (66.3)	56 (66.7)	0.957
LDL-c > 100 mg/dL	83 (48.8)	43 (50.0)	40 (47.6)	0.641
Triglycerides > 150 mg/dL	27 (15.9)	11 (12.7)	16 (19.0)	0.279
HDL-c < 40 mg/dL (males) and < 50 mg/dL (females)	39 (22.9)	15 (17.4)	24 (28.5)	0.099

Data is presented as mean ± SD or number (percent)
Weight status in 158 subject (80 males); blood pressure in 152 subjects (74 males)
Comparison between sexes were analyzed by independent sample t - or chi-square tests

CLUSTERING OF CARDIOVASCULAR DISEASE RISK FACTORS

	In 1998	Last visit
Additional CVD risk factors	**79.5%**	**91.3%**
• borderline dyslipidemia/dyslipidemia	37.5%	60.8%
• pre-hypertension/hypertension	27.6%	24.3%
• overweight/obesity	16.5%	39.9%
Multiple (≥ 2) CVD risk factors	41.6%	63.4%

54% reported positive family history (first-degree relative)
No significant differences between sexes

FACTORS ASSOCIATED WITH DYSLIPIDEMIA

	ß (SE)	P	95% CI for ß
LDL-c			
Diastolic BP 1998	14.3 (5.1)	0.007	4.09, 24.5
Positive family history of CVD	11.5 (5.6)	0.044	0.34, 22.6
Triglycerides			
Diastolic BP 1998	23.4 (10.9)	0.035	1.7, 45.1
Mean Hba1c from 1998-2008	16.1 (5.5)	0.004	5.2, 27.1
Total cholesterol			
Diastolic BP 1998	17.9 (6.0)	0.004	6.0, 29.7
Mean Hba1c from 1998-2008	6.5 (3.0)	0.033	0.5, 12.5
Positive family history of CVD	14.1 (6.5)	0.033	1.1, 27.0
Sex	11.4 (5.3)	0.036	0.8, 22.0

Factors associated with 10-year outcomes of lipid profiles were analyzed by stepwise linear regression models. Potential predictors and confounders included in the analyses were sex, ethnicity, Tanner stage, BMI-SDS, systolic and diastolic blood pressure, glycosylated hemoglobin (HbA1c) levels, age at diagnosis and T1D duration, family history of cardio-metabolic diseases.

CONCLUSIONS

Our findings suggest that elevated lipid levels are associated with glycemic control, diastolic blood pressure and positive family history of CVD.
Female sex was associated with higher total cholesterol levels.
Since poor glycemic control and elevated blood pressure aggravate the risk for dyslipidemia, careful surveillance is warranted to prevent and control these modifiable risk factors already from childhood.
The more prominent clustering of CVD risk factors in poorly controlled T1D patients underscores the importance of a more vigorous intervention in this group.