Introduction and Objectives
Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood and can profoundly affect the academic achievement, well-being, and social interactions of children. Efficient cognitive skills, especially in the domain of executive functions, are needed for successful management of type 1 diabetes (DM1). Dual diagnosis of DM1 and ADHD can lead to suboptimal diabetes control with its implications for development of acute complications (hyperglycemia and ketoacidosis) and long-term diabetes complications.

Objectives of the study:
To compare metabolic control of DM1 patients with ADHD to DM1 patients without ADHD, including HbA1c, time in range, glucose variability.
To compare short term complications (severe hyperglycemia, DKA, hospitalization).
To compare quality of life.

Methods
DM1 patients aged 6-18 years with a least 6 months duration of diabetes. The study population comprised two groups:
1) The ADHD Group consisted of DM1 patients with previous and formal diagnosis of ADHD that was done by a professional.
2) The Control Group comprised DM1 patients without ADHD (after completing DSMS ADHD questionnaire and ADHD was ruled out).
Diabetes QOL questionnaire was given to parents of all patients.
Diabetes data (glucosensors, glucometer, insulin-pumps) was downloaded to all patients.
Data from the patients' files were retrieved.

Results
The study cohort comprised 111 patients with T1DM: 27 were diagnosed with ADHD (24%) and 84 without ADHD (Control group) (table 1).
Mean±SD age of the ADHD group and Control group was 14.6±2.8 and 12.6±3.3 years, respectively (p=0.006).
Mean HbA1c was significantly higher in the ADHD group, 8.5±1.2 % vs. 7.8±1.0 % (p=0.003).
There was no difference in QOL and in severe hyperglycemia or DKA events between the groups (table 1).
Among patients using CGM data in range (TIR 70-180 mg/dl) was significantly lower in the ADHD group, 49%±17 % vs. 59±15% (p=0.05) (figure 1, table 2).
The following parameters retrieved from CGM data in the ADHD group vs. the Control group: mean glucose, SD of glucose, percentage time above 180 mg/dl, percentage time above 240 mg/dl, and in glucose variability parameters: ADRR, HBG, MAGE (table 2).
In a sub-analysis comparing between the Control Group, medically treated ADHD patients and medically untreated ADHD patients:
HbA1c was significantly higher in the untreated ADHD group compared to the control group.
There were significantly more hospitalizations in the untreated ADHD group compared to the control group, and most of them were due to DKA (table 3).
Mean SMBG values, SMBG percent values > 180 mg/dl and > 240 mg/dl were higher in the untreated ADHD group than in the treated ADHD group and the Control group.

Discussion
Coexistence of T1DM and ADHD during childhood leads to significantly higher HbA1c, TIR and glucose variability parameters compared to patients without ADHD.
Untreated ADHD patients seem to have worse glucose parameters and more short term complications.
Healthcare providers should be aware of the difficulties of patients with T1DM and ADHD to get organized and to cope with the current intensive treatment of diabetes.
Further studies are needed to examine the importance of medical treatment for ADHD as a strategy to improve diabetes control.