

Agnieszka Butwicka ¹, Wojciech Fendler ², Adam Zalepa ³, Agnieszka Szadkowska ², Anna Iza Baranowska ², Agnieszka Gmitrowicz ⁴, Wojciech Młynarski ²

¹ – Department of Child Psychiatry, Medical University of Warsaw, Poland, ² – Department of Pediatrics, Oncology, Hematology and Diabetology, Medical University of Lodz, Poland
³ – Warsaw School of Social Science and Humanities, Poland, ⁴ – Department of Adolescent Psychiatry, Medical University of Lodz, Poland

e-mail: agnieszka.butwicka@gmail.com

BACKGROUND

Type 1 diabetes mellitus (T1DM) is associated with three fold higher incidence of psychiatric disorder compared to general population (33.3% vs 9.7%) [1]. High level of symptoms of psychiatric disorders among adolescents with T1DM increased the odds of inadequate metabolic control, acute complications and subsequent hospitalization [2,3].

Numerous reports on T1DM indicate that reduction of glycated hemoglobin level (HbA1c), risk of acute diabetes related complications, better quality of life and increase in cost-effectiveness can be achieved through the use of continuous subcutaneous insulin infusion (CSII) [4,5]. There are no data, however, concerning the impact of insulin regimen on metabolic control in individuals with T1DM and psychiatric diagnosis neither in adult nor in the pediatric population.

OBJECTIVES

To evaluate the influence of psychiatric co-morbidity and its interaction with insulin regimen on metabolic control and hospitalization time in children with type 1 diabetes mellitus.

METHODS

SAMPLE

The study was a cross-sectional analysis of psychiatric co-morbidity in children with type 1 diabetes participating in a longitudinal observational study. Of 862 children diagnosed as having T1DM in the Lodzkie administrative region in central Poland between 2003 and 2010, 211 (24.5%) met the predefined inclusion criteria: at least 8 years old, duration of diabetes of at least one year, at least three HbA1c measurements per year, and lack of significant coexisting diseases. All patients were dependent on insulin from the time of diagnosis. Of the 211 eligible patients, 176 agreed to participate [81 children treated with multiple daily injections (MDI) and 95 with CSII]. The mean time of observation before psychiatric evaluation was 4.1±1.7 years.

MEASURES

Schedule for Affective Disorders and Schizophrenia for Children (KSADS-PL)

The K-SADS-PL is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents according to DSM-IV criteria. Psychiatric diagnoses were based on the DSM-IV TR criteria and independent interviews with children and one of parent. The interviewer was not involved in diabetes treatment of the patient, had graduate degree in psychology or was a child and adolescent psychiatrist.

HbA1c measures

For each patient, the mean HbA1c level from the preceding year was calculated. HbA1c assays were performed by ion-exchange high-performance liquid chromatography (HPLC) using the Bio-Rad VARIANTTM Hemoglobin A1c Program meeting the Diabetes Control and Complications Trial standard.

STATISTICAL ANALYSIS

Analysis of covariance (ANCOVA) models were used for comparisons of mean HbA1c and the number of hospital days per patient-year with adjustment for duration of diabetes. Type of insulin treatment used over the observation period (CSII or MDI) was included in model to assess possible interaction between psychiatric disorder and form of insulin regime. 95% Confidence intervals (95%CI) were calculated where possible. Post hoc comparisons using Tukey's HSD test were performed for pairwise comparisons. A p value of <0.05 was considered as statistically significant. Statistical analysis was performed using Statistica 9.0 (StatSoft, Tulsa, OK, USA).

RESULTS

Table 1 – Characteristics of the study groups according to psychiatric co-morbidity status. CSII: Continuous subcutaneous insulin infusion; MDI: multiple daily injections; HbA1c: glycated hemoglobin.

	Psychiatric co-morbidity N=44	No psychiatric co-morbidity N=132	P value
Males/Females	23/21	81/52	0.3761
CSII/MDI	23/21	72/61	0.9342
Age at psychiatric evaluation [years]	13.8 (13.0 – 14.5)	13.8 (13.3 – 14.2)	0.9833
Duration of diabetes at psychiatric evaluation [years]	4.3 (3.8 – 4.9)	4.0 (3.7 – 4.3)	0.3176
Mean HbA1c in last year [%] (normal range 4.3-5.7%)	8.6 (8.1 – 9.1)	7.6 (7.3 – 7.8)	0.0005
Days in hospital per year	11.0 (9.4 – 12.5)	7.8 (6.9 – 8.7)	0.0007
Number of admissions per year	1.4 (1.2 – 1.5)	1.2 (1.1 – 1.3)	0.2961

RESULTS

Of 176 studied patients, at the time of evaluation 44 (24.6%; 95%CI 37-51%) met the criteria for at least one psychiatric disorder. The most frequent diagnoses were: anxiety disorders (n=28); disruptive behavioral disorders (n=10); and mood disorders (n=6). The group with psychiatric disorders had higher mean HbA1c values (p<0.001) over the preceding year and spent more days in hospital per year (p<0.001) in comparison to that without psychiatric co-morbidity. Number of admissions per year did not differ significantly between groups (p=0.29). Detailed group characteristics stratified by the psychiatric co-morbidity status are presented in the Table 1. Furthermore, CSII treatment was associated with shorter hospitalization time per year (p<0.0001) and better metabolic control in the last year (p=0.0023) than treatment with MDI. Type of insulin regimen had no effect on number of admissions per year (p=0.23) and quality of life (p=0.97). Significant interactions between insulin regimen and psychiatric diagnosis were found for mean HbA1c level (p=0.0166; Figure 1A), percentile of HbA1c (p=0.0401) and duration of hospitalization (p=0.0009; Figure 1B).

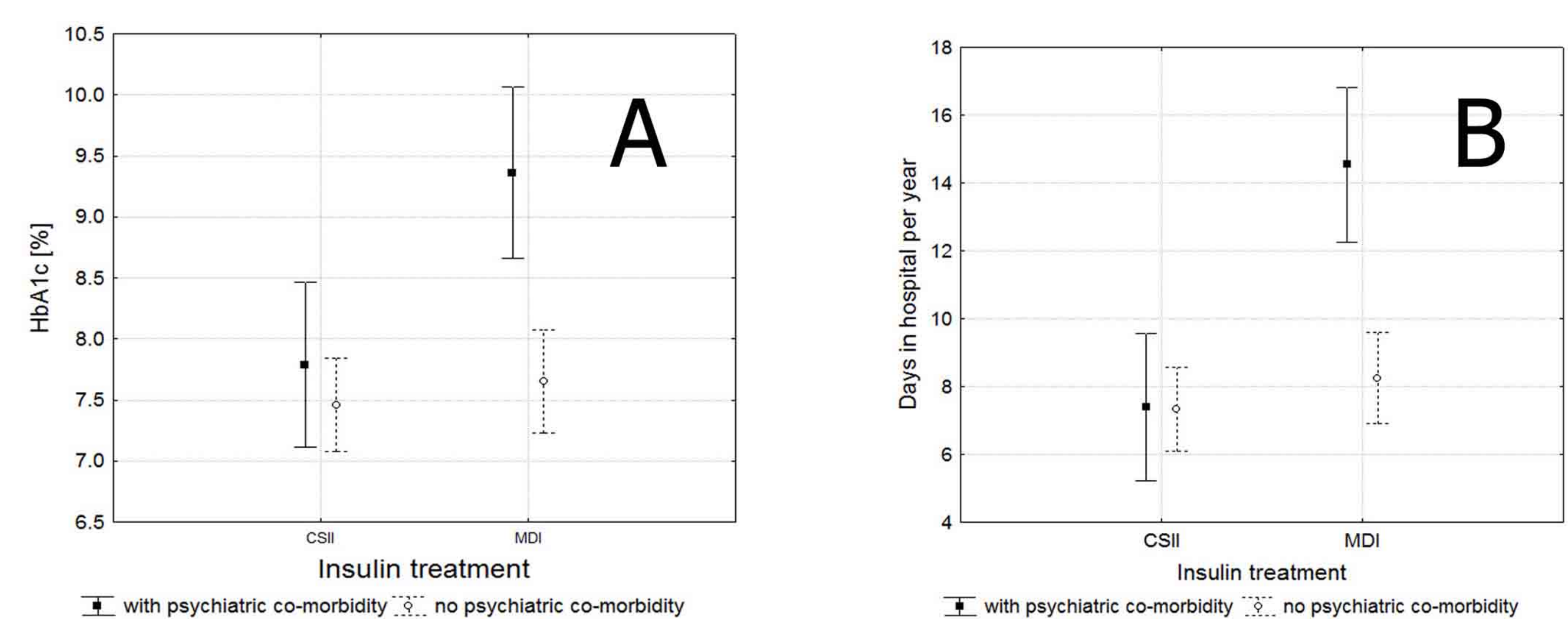


Fig.1 Differences in hemoglobin (HbA1c) levels (A) and duration of hospital stay (B) among children with and without psychiatric co-morbidity treated with multiple daily injections (MDI) or continuous subcutaneous insulin infusion (CSII). The difference between MDI and CSII-treated patients was significant at the end of the observation period. Data are depicted as means with 95% Confidence Intervals.

These interactions between type of treatment and mental health showed that children with underlying psychiatric co-morbidity treated with CSII did not differ from psychiatrically healthy peers in terms of metabolic control and time spent in hospital (all p>0.80). However, among individuals treated with MDI, psychiatric diagnosis was related to higher mean HbA1c values (p=0.0059), percentile of HbA1c (p=0.0003) and longer duration of hospitalization (p=0.0001). Data on these interactions were presented in the table 2

Table 2 – Metabolic control, quality of life, duration of hospital stay, number of admissions. Data are presented as means and 95% confidence intervals. CSII: Continuous subcutaneous insulin infusion; MDI: multiple daily injections; HbA1c: glycated hemoglobin.

Treatment effects		Psychiatric co-morbidity N=44	No psychiatric co-morbidity N=132	P value
Mean HbA1c in last year [%] (normal range 4.3 – 5.7%)	MDI	9.4 (8.7 – 10.1)	7.7 (7.1 – 8.1)	0.0003
	CSII	7.8 (7.1 – 8.5)	7.5 (7.1 – 7.8)	0.8398
Days in hospital per year	MDI	14.5 (12.3 – 16.8)	8.3 (6.9 – 9.6)	0.0001
	CSII	7.4 (5.2 – 9.6)	7.3 (6.1 – 8.5)	0.9999
Number of admissions per year	MDI	1.5 (1.2 – 1.7)	1.3 (1.1 – 1.4)	0.9971
	CSII	1.2 (1.0 – 1.5)	1.2 (1.1 – 1.4)	0.5938

CONCLUSIONS

Children with type 1 diabetes mellitus and psychiatric co-morbidity are more likely to have worse metabolic control and have longer hospitalizations than their peers without psychiatric disorders. CSII may be beneficial in such patients.

REFERENCE

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