Type 1 diabetes is associated with alexithymia in nondepressed, non-mentally ill diabetic patients: A case-control study

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Abstract

Objective: Alexithymia refers to difficulty in identifying and expressing emotions, and it is a characteristic common to several psychiatric and medical conditions, including autoimmune disorders. Type 1 diabetes (T1D) is an autoimmune disorder with increased psychiatric comorbidity. Previously reported associations between alexithymia and T1D may have been confounded by the presence of depression. The central aim of this study was to examine alexithymia levels in psychiatrically uncomplicated T1D outpatients with that of nondiabetic controls.

Methods: Ninety-six T1D patients without any DSM-IV Axis I diagnoses and 105 age- and sex-matched healthy controls entered the study. Alexithymia and depressive symptoms were assessed with the Toronto Alexithymia Scale (TAS-20) and the Beck Depression Inventory (BDI-21), respectively. Multivariate regression models were used to evaluate the association of alexithymia with the presence of diabetes, duration of diabetes, diabetes control, parameters of treatment intensification, and diabetic complications.

Results: T1D was positively associated with the TAS-20 "identifying feelings" (β coefficient=2.64, \(P=0.003\)) and "externally oriented thinking" (β coefficient=1.73, \(P=0.011\)) subscales. The prevalence of overall alexithymia (TAS-20 total score, ≥60) was 22.2% in T1D patients and 7.6% in the controls (OR, 4.6; 95% CI, 1.7–12.8). TAS-20 scores were positively associated with diabetes duration and negatively with treatment intensification parameters.

Conclusions: Alexithymia is higher in psychiatrically uncomplicated T1D patients than in healthy controls even after adjustment for confounding depressive symptoms; it is greater with longer diabetes duration and is associated with some reduced parameters of treatment intensification but not with worse outcome in terms of glycemic control or somatic complications.

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Keywords: Alexithymia; Type 1 diabetes; Depression; Case-control study

Introduction

Type 1 diabetes (T1D) has long been identified as a disease with increased psychiatric comorbidity such as anxiety and depression [1,2]. In the face of a complex, demanding, and often confusing set of self-care directives, patients may become frustrated, angry, overwhelmed, and/or discouraged while they have to cope with life-threatening risk of metabolic dyscontrol, conflicts with family, and the potential strained relationships with health care providers [3].

Alexithymia [4,5] is viewed as a dimensional personality construct that encompasses a cluster of cognitive and affective characteristics relating to a deficiency in identifying and describing emotions, externally oriented thinking style, and limited imaginal capacity, resulting in deficient self-regulation of affective responses and dissociation of emotional and physical responses to life events and bodily sensations [6–10]. These alexithymic characteristics are thought to contribute to the onset or maintenance of several...
psychosomatic, medical, and psychiatric disorders [6], as a risk factor for these disorders [6,11,12], but equally, trauma, stress, or even health problems during adolescence or adulthood can trigger alexithymia [12], so-called secondary alexithymia [13,14]. Although alexithymia has also been viewed as a defense mechanism that protects chronically ill patients from stress and its consequences [15], it is predominantly considered a deficit rather than a defensive process [12] and this deficit view is gaining increasing support from basic laboratory research [16–19].

There are few studies that examined the association between alexithymia and T1D [20–23], and only two compared the prevalence of alexithymia in diabetic patients with that of a control group [20,23], while no study excluded diabetic subjects diagnosed with clinical depression or other psychiatric disorders. The latter may be prevalent in diabetes [1,2] and is associated with alexithymia [21,24–26]. The aim of the present case-control study was to measure the levels and prevalence of alexithymia and perceived depression in T1D outpatients who did not meet the criteria for major depression or any other psychiatric diagnosis. A secondary goal was to examine whether alexithymia was associated with duration of T1D, parameters of treatment intensification, glycemic control, and diabetic complications.

Methods

Participants

The study was approved by the Venizelion Hospital Ethics Committee. All T1D outpatients followed up for at least 1 year in the Diabetic Clinic of Venizelion General Hospital in Heraklion, Greece (N=110), were asked to participate in the study. One hundred and six patients (96%) agreed to participate. Inclusion criteria were age 18–60 years and written informed consent, while exclusion criteria were (i) blindness (one subject); (ii) end-stage renal disease (one subject); (iii) nonfluent in written and spoken Greek language (one subject); (iv) any DSM-IV Axis I disorder currently or in the last 12 months, based on a Structured Clinical Interview for DSM-IV Axis I Disorders [27]. Ninety-six T1D patients met these criteria and entered the study. One hundred and five sex- and age-matched (within a 5-year window) healthy controls without a previous history of diabetes and/or depression were recruited, based on medical records and a Mini-International Neuropsychiatric Interview [28]. They were identified from lists of employees living in the same town of Heraklion and were selected from nurses and office workers of the university hospital and from postal clerks at the central office of the town.

Diabetes characteristics—complications of disease

The medical data collected by three diabetologists (IC, EK, MS) included information on duration of type 1 diabetes (years since diagnosis), number of glucose measurements per week, number of insulin injections per day, number of mild hypoglycemias during the past week, number of severe hypoglycemias that required hospitalization during the past year, and medical history of coronary heart disease. Diabetic retinopathy was established with retinal examination using an indirect ophthalmoscope following pupil dilatation and/or fluororoangiography if necessary. Diabetic nephropathy was determined by micro- or macroalbuminuria. HbA1c measurement was performed with a Bayer DCA2000 Analyzer, a model that is certified by the USA National Glycohemoglobin Standardization Program for its comparability to the reference methods established by the Diabetes Control and Complication Trial [29].

Instruments

All participants were asked to answer a questionnaire on sociodemographic characteristics: age, education level (years of education), socioeconomic background (using the UK Registrar General’s 1990 classification according to occupation by ISCO88 code), marital status, weight and height (self-reported), and smoking status (current smoker/ex-smoker/never smoker).

Toronto-Alexithymia Scale

Alexithymia was assessed with a validated Greek translation of the 20-item Toronto Alexithymia Scale (TAS-20), comprising three factors: difficulties identifying feelings, difficulties expressing feelings, and externally oriented thinking, each yielding a subscale score [30,31]. In the Greek TAS confirmatory factor analysis study, the three factor scores revealed no significant differences between the normal adults and asthmatic patients [30]. TAS-20 has been the most widely used measure in alexithymia research, and a wealth of data have been accumulated supporting its validity to predict both basic emotional processes and clinical criteria [12,31]. Items consist of statements presented in a five-point Likert scale (score, 1–5) along a strongly disagree to strongly agree continuum, with higher scores indicating more alexithymia.

Beck Depression Inventory

All participants were asked to fill in the Beck Depression Inventory, 21-item version (BDI-21), a widely used and well-validated self-report inventory of depressive symptoms [32].

Statistical analysis

The statistical software SPSS 15.0 (SPSS, Inc., Chicago, IL, USA) was used for the analysis. Univariable analysis of categorical variables was made using the Pearson chi-square test. Continuous variables were presented as means and standard deviations (S.D.), and univariable analysis was made using both parametric (independent samples t test) and nonparametric (Mann–Whitney) tests, as appropriate. TAS-20 total scores were used dimensionally (score range,
20–100) or categorically, indicating yes or no alexithymia (score, ≥60 and <60, respectively) [33]. BDI-21 scores were used either as a continuous (score range, 0–63) or a categorical variable with a cut-off point of 14/15 to categorize the study subjects with self-reported depression (total score, ≥15) or nondepression (total score, ≤14) [34].

Multivariable linear regression models were performed to evaluate the association of TAS-20 subscale scores with the presence of diabetes (duration of diabetes, age of onset), diabetes control (HbA1c, number of mild or severe hypoglycemia in the last year), parameters of treatment intensification (number of glucose measurements/week, number of insulin injections/day), and diabetic complications (retinopathy, coronary heart disease, nephropathy). In addition, we performed a sensitivity analysis using TAS-20 total score as a categorical variable (multivariate logistic regression). The following variables were considered as potential confounding factors: age, sex, BMI, education, smoking status, and perceived depression (BDI-21 scores). All hypothesis testing was conducted assuming a .05 significance level and a two-sided alternative hypothesis.

Results

Table 1 describes the sociodemographic characteristics of T1D patients and controls and the clinical profile of the T1D patients. Cases and controls did not differ significantly in terms of BMI, smoking, and marital status, whereas the T1D patients had lower educational level than controls (P=.023).

Mean (±S.D.) TAS-20 total and subscales scores were 48.3±11.9 (subcales: “identifying feelings,” 16.9±6.4; “expressing feelings,” 11.8±4.4; and “externally oriented thinking,” 19.5±4.7) for the patients and 41.6±10.9 (subcales: “identifying feelings,” 13.4±6.1; “expressing feelings,” 10.9±4.0; and “externally oriented thinking,” 17.3±4.6) for the controls. Table 2 presents the full findings of the final linear regression models for the three TAS subscales, including as potential confounders only those variables which related with the outcome of interest in the bivariate models with a P value of <.2 (i.e., education and BDI-21 score). T1D was positively associated with the “identifying feelings” and “externally oriented thinking” subscales. Identical results were obtained when age, sex, BMI, and smoking status were included as additional potential confounders. The prevalence of overall alexithymia (TAS-20 total score, ≥60) was 22.2% in T1D patients and 7.6% in the controls (OR, 4.6; 95% CI, 1.7–12.8, after adjusting for the same confounders as in Table 2).

Mean (±S.D.) BDI-21 score was 8.5±11.9 in diabetic subjects and 7.6±10.9 in controls (β coefficient=0.52, P=.629). The prevalence of self-reported depression (BDI-21 score, ≥15) did not differ significantly between the two groups (16% in cases vs. 12.4% in the controls; P=.221). TAS-20 and BDI-21 scores were correlated significantly in T1D patients (r=0.265, P=.012) and controls (r=0.518, P<.001); therefore, we included BDI-21 score as an independent variable in the multivariate regression models.

In the group of diabetic patients, duration of diabetes was associated with increased total TAS-20 score (β coefficient=0.25, P=.055) and, in particular, with the “identifying feelings” subscale at a trend level (β coefficient=0.14, P=.061) and the “externally oriented thinking” subscale (β coefficient=0.10, P=.047). On the other hand, alexithymia (total TAS-20 score) was inversely associated with some parameters of treatment intensification, indicating a trend level reduction of 0.16 for the number of glucose measurements per week (β coefficient=−0.16, P=.074) and 2.06 for the number of insulin injections per day (β coefficient=−2.06, P=.05). There were no associations between alexithymia and T1D age of onset (β coefficient=0.27, P=.09), number of hypoglycemies in the last year (β coefficient=0.88, P=.16), HbA1c (β coefficient=−0.04, P=.97), or presence of somatic complications (β coefficient=4.78, P=.09).

Discussion

This is the first study to examine alexithymia in a nondepressed, but demographically and nosologically,
representative sample of T1D patients compared to healthy
controls. Inclusion of alexithymia either as a dimensional or
as a dichotomous variable in the analyses always showed
higher levels or prevalence, respectively, of alexithymia in
the T1D patients compared to healthy controls in the absence
of depression or any other psychiatric disorder. We report
lower prevalence of alexithymia in our T1D group compared
to previous studies on T1D patients [23] or on T1D patients
undergoing hemodialysis [35–37]. This may be because
depression and other psychiatric diagnoses were excluded
from our sample and the possibility that T1D undergoing
hemodialysis may be at the more severe end of the spectrum
with high psychiatric comorbidity. Alexithymia is a normally
distributed personality trait with a prevalence varying from
7% to 13% in the general population [24,38,39], which is in
accordance with its prevalence in our control group. Our
results could not be attributed to differences in prevalence
of BDI-21-defined depression, level of depressive symptomatology, or demographic variables since the two groups did
not differ in this respect and the small difference in years of
education was controlled for.

We found that alexithymia levels in psychiatrically
uncomplicated T1D were associated with marginally fewer
blood glucose measurements per week and fewer self-
administered insulin injections per day. These findings are
open to two contrasting interpretations: (a) reduced motiva-
tion or capacity for self-management in the most alexithymic
patients. The most obvious implication here would be the
need for enhanced support in T1D patients in the context of a
multidisciplinary approach, given the role of compliance in
the prognosis of metabolic control and the course of T1D
[40–42]. However, this interpretation would be inconsistent
with a previous report suggesting that alexithymia was
unrelated to adherence in diabetes treatment [21]. Future
research should include rigorous and quantified assessment
of compliance in nondepressed T1D patients; (b) alterna-
tively, it is possible that higher alexithymia in nondepressed/mentally ill T1D patients is associated with a more favorable
course of the illness such that prescription of treatment
intensification may be less required. It is interesting in this
respect that alexithymia in T1D was not associated with
glycemic control or diabetes complications, which is in
contrast to previous reports [20,22,23]. This discrepancy
may be due to the exclusion of T1D patients with depression
and other psychiatric syndromes, in contrast to all previous
studies. Depression may affect motivation and self-care
(DSM-IV) [43] and is associated with reduced compliance, self-care, and glycemic control in T1D [40,41,44]. Indeed,
alexithymia was found to be associated with depression, but
alexithymia alone was unrelated to somatic variables in T1D
[21], severity of chronic pain [45], or other serious medical
conditions [46]. All the above taken together suggest that
depression may be a confounder in studies of alexithymia
levels in T1D or its effect on T1D outcome, and that depression more than alexithymia led to loss of glycemic
control in previous studies which had not excluded
depressed T1D patients.

The observation that alexithymia levels were greater with
greater T1D duration could suggest that alexithymia
develops post T1D diagnosis as a consequence of diabetes.
Such secondary alexithymia has been previously shown to
develop following trauma, stress, or health problems during
adolescence or adulthood. Indeed, substantial elevation of
alexithymia was found in Holocaust survivors [47], victims
of sexual violence [48], patients with posttraumatic stress
disorder [49–51], those who have suffered severe burns [52],
and patients undergoing chronic and intrusive treatments
such as hemodialysis [35–37] and after a head injury [53].
Secondary alexithymia has been related to the consequence
of the distress associated with the psychiatric disorder [13]

### Table 2
Multivariable linear regression models of the determinants of TAS-20 subscale scores

<table>
<thead>
<tr>
<th>Model predictors</th>
<th>Unstandardized coefficients</th>
<th>Standard error</th>
<th>Standardized coefficients</th>
<th>β</th>
<th>t</th>
<th>Significance</th>
<th>95% Confidence interval for B</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TAS-20 “Identifying feelings” subscale</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>−0.74</td>
<td>0.56</td>
<td>−0.10</td>
<td>1.33</td>
<td>.185</td>
<td>−1.84</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Presence of type 1 diabetes a</td>
<td>2.64</td>
<td>0.88</td>
<td>0.17</td>
<td>2.38</td>
<td>.003</td>
<td>0.36</td>
<td>3.89</td>
<td></td>
</tr>
<tr>
<td>BDI-21 score b</td>
<td>0.33</td>
<td>0.06</td>
<td>0.37</td>
<td>5.44</td>
<td>.001</td>
<td>0.21</td>
<td>0.44</td>
<td></td>
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<tr>
<td><strong>TAS-20 “Expressing feelings” subscale</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Years of education</td>
<td>−0.58</td>
<td>0.38</td>
<td>−0.12</td>
<td>1.54</td>
<td>.125</td>
<td>−1.32</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Presence of type 1 diabetes</td>
<td>0.33</td>
<td>0.59</td>
<td>0.13</td>
<td>1.80</td>
<td>.583</td>
<td>−0.04</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>BDI-21 score b</td>
<td>0.19</td>
<td>0.04</td>
<td>0.34</td>
<td>4.72</td>
<td>.001</td>
<td>0.11</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td><strong>TAS-20 “Externally oriented thinking” subscale</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>−0.73</td>
<td>0.44</td>
<td>−0.13</td>
<td>1.67</td>
<td>.096</td>
<td>−1.59</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Presence of type 1 diabetes</td>
<td>1.73</td>
<td>0.68</td>
<td>0.15</td>
<td>1.96</td>
<td>.011</td>
<td>−0.01</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>BDI-21 score b</td>
<td>0.04</td>
<td>0.05</td>
<td>0.07</td>
<td>0.96</td>
<td>.339</td>
<td>−0.05</td>
<td>0.14</td>
<td></td>
</tr>
</tbody>
</table>

* Reference category: healthy controls.
* BDI-21 score: Beck Depression Inventory score.
and has been reported to be influenced by psychiatric states such as anxiety, depression, and anhedonia [54]. The frequently observed association between alexithymia and depression or anxiety has suggested a state-dependent phenomenon [25,55,56] whereby high alexithymia reflects current affect and situational variables that impose on one’s cognitive/affective processing capacity. It is thus important that, compared to controls, we observed higher alexithymia in T1D patients who were free of psychiatric illnesses, especially depression. Our findings placed in the context of the general literature suggest that alexithymia, at least in T1D, may be a complex manifestation that includes both T1D-specific (trait) and state components. Future research should attempt to differentiate these by assessing premorbid or developmental functioning.

How does the presence of diabetes affect one’s ability to identify and process one’s emotions? Emotional processing depends normally on the activity of certain brain areas, the volume of which is reported to be reduced in alexithymic persons [54]. The activation of these areas is required to better understand the physiological mechanisms of the observed associations.

In conclusion, the present study suggests that, compared to healthy controls, the levels and prevalence of alexithymia are higher in nondepressed or otherwise mentally ill T1D patients, after controlling for confounders such as education and subjective depressive symptomatology. Higher alexithymia in the patient group was associated with greater T1D duration and some reduced parameters of treatment intensification but not with worse outcome in terms of glycemic control or somatic complications. More comprehensive and longitudinal studies with larger samples are required to better understand the physiological mechanisms of the observed associations.

**References**


