

Phobic Symptoms, Particularly the Fear of Blood and Injury, Are Associated With Poor Glycemic Control in Type I Diabetic Adults

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OBJECTIVE — To investigate the presence of psychiatric disorders and symptoms in type I diabetic patients and to identify those that may influence metabolic control as assessed by GHb levels.

RESEARCH DESIGN AND METHODS — This was a cross-sectional study. One hundred and two consecutive patients with type I diabetes who were regular outpatient visitors of a diabetology department were evaluated. The psychiatric assessments included self-rating questionnaires (General Health Questionnaire and Fear Questionnaire) and observer-rating questionnaires (Montgomery-Asberg Depression Rating Scale [MADRS] and Mini International Interview). Diabetic characteristics were assessed by a structured interview. The observer was blind to the diabetic characteristics of the patients.

RESULTS — Type I diabetic patients with GHb levels $\geq 8\%$ had higher psychological distress, scored significantly higher for symptoms of agoraphobia and for fear of blood and injury, had substantially higher levels of anxiety-depression, and performed significantly fewer blood glucose measurements per day. They did not differ in MADRS score from patients with GHb levels $< 8\%$. Multivariate analysis showed that GHb was positively associated with the total score of phobic symptoms and the level of anxiety-depression and inversely associated with the number of daily blood glucose measurements. These factors explained 41% of the variance of GHb. The inverse relationship between GHb and the number of blood glucose measurements per day was mainly influenced by the fear of blood and injury. Patients with high scores for the fear of blood and injury performed fewer blood glucose measurements and had poorer glycemic control; conversely, subjects without fear of blood and injury performed more daily blood glucose measurements and had better glycemic control.

CONCLUSIONS — Phobic symptoms are frequent in patients with type I diabetes. The intensity of phobic symptoms and anxiety-depression negatively influences metabolic control. Increased fear of blood and injury may lead some patients to perform few home blood glucose measurements and may result in poorer glycemic control. This suggests that, by decreasing the fear of blood, injury, and injection, metabolic control may be improved.

In the last decade, interest in psychosocial factors in diabetes has increased. Several studies have found a high prevalence of psychiatric morbidity, particularly depression, among type I diabetic patients (1).

Phobic disorders have also been found to be more prevalent in type I diabetic candidates for pancreas transplantation with various diabetic complications than in pancreas donors (2). Psychiatric conditions and psy-

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DSM, *Diagnostic and Statistical Manual*; MADRS, Montgomery-Asberg Depression Rating Scale; MINI, Mini International Neuropsychiatric Interview.

chological or psychosocial factors have been found to be associated with metabolic control (3–5). On the other hand, the role of phobic disorders in metabolic control has not yet been extensively studied.

Therefore, the aim of this study was to investigate psychiatric disorders and symptoms, particularly phobic symptoms, and their effect on glycemic control in adults with type I diabetes.

RESEARCH DESIGN AND METHODS

Patients

Patients with type I diabetes were asked to participate in this study. They were all regular visitors to the Department of Diabetology at the Pitié-Salpêtrière Hospital, Paris. To be included, patients had to have type I diabetes, to be C-peptide negative after the administration of 1 mg i.v. glucagon, to have a duration of diabetes > 2 years, to be > 18 years of age, to give their informed consent, and to be able to respond to questionnaires. None of the patients included in the study was treated by continuous subcutaneous insulin infusion. All patients had previously participated in a standardized diabetes education program carried out by the same person (C.S.), in which the diabetic condition and adequate self-care were explained and home blood glucose monitoring was learned. According to the Ethics Committee of the Pitié-Salpêtrière Hospital, the study was considered an epidemiological inquiry that did not require approval.

Data collection and assessments

Patients were assigned to a psychiatrist (R.E.) by their diabetologists for psychiatric assessment. The psychiatrist was blind to the medical history and diabetic characteristics of the patients.

The General Health Questionnaire is a self-administered instrument designed for use in primary care settings and aimed at detecting those patients with a diagnosable psychiatric disorder (6). The 12-item ver-

Table 1—Psychiatric characteristics of type 1 diabetic patients with GHb <8 and ≥8%

	GHb <8%	GHb ≥8%	P value
<i>n</i>	51	51	—
Sex (M/F)	32/19 (63/37)	24/27 (47/53)	NS
Age (years)	43 ± 12 (20–68)	43 ± 15 (18–72)	NS
Duration of diabetes (years)	17 ± 10 (2–42)	19 ± 11 (2–47)	NS
GHb (%)	7.1 ± 0.6 (5.5–7.8)	9.1 ± 1.2 (8–12)	0.0001
Number of blood glucose measurements per day (n)	3.4 ± 1.9 (0–10)	2.6 ± 1.9 (0–6)	0.03
General Health Questionnaire	1.6 ± 2 (0–8)	2.9 ± 3.5 (0–12)	0.02
MADRS	3.8 ± 5.5 (0–20)	5.8 ± 7.3 (0–29)	NS
Fear Questionnaire			
Agoraphobia	5.3 ± 7 (0–30)	7.7 ± 7.7 (0–32)	0.04
Fear of blood and injury	8.1 ± 5.7 (0–24)	10.9 ± 7.8 (0–28)	0.02
Social phobia	8 ± 7.1 (0–30)	7.8 ± 6.2 (0–24)	NS
Total score	24.1 ± 18 (0–72)	31.8 ± 17 (2–72)	0.03
Main target phobia	1.3 ± 2.6 (0–8)	2.6 ± 3.3 (0–8)	0.01
Degree of phobic disturbance (global phobia)	1.1 ± 1.4 (0–6)	1.8 ± 2.2 (0–8)	NS
Anxiety-depression	9.4 ± 7.8 (0–32)	15.1 ± 10.3 (0–44)	0.002

Data are means ± SD (range) or *n* (%). The total score is the sum of the scores of symptoms of agoraphobia, social phobia, and fear of blood and injury.

sion of the questionnaire was used. The General Health Questionnaire explores four axes: somatic symptoms, anxiety-insomnia, social dysfunction, and depressive. We used the validated French version of the General Health Questionnaire (7). The Fear Questionnaire of Marks and Mathews (8) is a 1-page questionnaire. It yields four scores: main phobia, global phobia, total phobia, and anxiety-depression. The total phobia score is composed of agoraphobia, the fear of blood and injury, and social phobia. The fear-of-blood-and-injury subscore is composed of the avoidance of the following items: injections or minor surgery, hospitals, the sight of blood, the thought of injury or illness, and going to the dentist. The anxiety-depression score reflects common non-phobic symptoms of anxiety and depression found in phobic patients and indicates more general affective disturbances. The test-retest reliability for the different subscores ranges from 0.79 to 0.96. Intercorrelations between the subscores are low ($R < 0.45$), suggesting that they can be considered different aspects of the phobic problem, and there is evidence that the questionnaire reflects the clinical status of patients. The validated French version of this questionnaire was used (9). The Montgomery-Asberg Depression Rating Scale (MADRS) is widely used to assess depression (10). Subjects with a score <15 are generally not considered depressive. The French version

of this scale has been validated (11). The Mini International Neuropsychiatric Interview (MINI) (12) is a structured instrument to explore lifetime and current psychiatric disorders according to *Diagnostic and Statistical Manual (DSM)-IV* criteria (13). HbA_{1c} was measured by high-performance liquid chromatography (Autoanalyser DIAMAT, Borad, France). The range for nondiabetic subjects in this hospital was 4.0–5.6%. The last GHb recorded was not more than 1 month before the assessments. Diabetes duration and the number of home blood glucose measurements per day were recorded by a structured interview.

Statistical analysis

Patients were divided into two groups according to their GHb value. The distribution of GHb in this population was normal. A cutoff of 8% divided the population into two distinct groups with 51 patients in each: the mean HbA_{1c} for the “group with good metabolic control” was 7.08% (95% confidence interval [CI] 6.92–7.25); the mean HbA_{1c} for the “group with poor metabolic control” was 9.13% (95% CI 8.8–9.45). Cross-tabulated frequencies were compared with Pearson's χ^2 test. The Student's *t* test was used for the comparison of continuously distributed variables, and Wilcoxon's test was used for ordered variables. All tests were two tailed. Multivariate analyses were performed by (stepwise) mul-

tiply linear regression analysis. Variables showing a significant ($P = 0.05$) relationship in the univariate analysis were included in the initial model. In the final model, only variables reaching the threshold of $P = 0.05$ were retained. A mediator variable analysis (14) was performed to appreciate the contribution of the fear of blood and injury to HbA_{1c}. Differences were considered significant at $P < 0.05$. Statistical analyses were performed using SPSS statistical software, release 6.0 (SPSS, Chicago, IL).

RESULTS

— One hundred and two patients participated in the study (56 men and 46 women). The mean age was 43 ± 13 years; the mean duration of diabetes, 18 ± 11 years; the mean HbA_{1c}, $8.1 \pm 1.4\%$; and 41% of the patients had at least one complication of diabetes. Twenty-eight (27%) diabetic patients reported a history of major depression, and 13 (13%) had major depression at the time of the study (10 out of these 13 reported also a past history of major depression), as defined by DSM-IV criteria. Lifetime and current general anxiety disorder were reported by 5 (5%) patients, respectively. Five patients reported history of social phobia (four reported current disorders), agoraphobia was reported by four patients (4%; 2 current disorders), one patient reported previous history of dysthymia, and another patient reported panic attacks.

Patients with GHb <8% or ≥8% did not differ in age or in duration of diabetes, but diabetic patients with GHb <8% performed more blood glucose measurements per day than diabetic patients with poor metabolic control (≥8%) (Table 1). Patients with poor metabolic control had higher psychological distress (scored significantly higher for the General Health Questionnaire), but the mean MADRS score was not different. The General Health Questionnaire score was significantly and positively associated with MADRS and anxiety-depression scores of the Fear Questionnaire (Multiple $R = 0.71$; $F_{2,99} = 49.14$; $P = 0.0001$), but it was not influenced by phobic factors. Ninety-six (94%) patients reported at least one phobic symptom. Patients with poor glycemic control had higher scores for symptoms of agoraphobia and fear of blood or injury. They did not differ for social phobia (Table 1). The total symptom score of these phobias and the intensity of the phobic symptoms that patients considered as their main phobia was also higher in this group, and they had substantially higher levels of anxiety-depression.

Stepwise multiple linear regression analysis was performed to investigate the association of different variables with metabolic control as expressed by GHb. Three variables constituted the final model: the total symptom score of phobias, the number of blood glucose measurements per day, and the score of anxiety-depression of the Fear Questionnaire (multiple $R = 0.41$; $F_{3,98} = 6.42$; $P = 0.0005$). The total symptom score of phobias (first step: $R = 0.29$, R^2 change = 0.086; standardized regression coefficient = 0.22, $t = 2.28$, $P = 0.02$) and the anxiety-depression score (third step: $R = 0.41$, R^2 change = 0.035, $P = 0.04$; standardized regression coefficient = 0.21, $t = 2.04$, $P = 0.04$) were positively correlated with GHb, and the number of blood glucose measurements per day was negatively correlated (second step: $R = 0.36$, R^2 change = 0.043, $P = 0.029$; standardized regression coefficient = -0.25 , $t = -2.64$, $P = 0.0098$) with GHb. For each of these three relationships, the goodness-of-fit testing gave significant results for a linear relationship. The measures of collinearity showed that the correlations between the independent variables were very low. Further analysis showed that the fear of blood and injury mediated the effect of the number of blood glucose measurements per day on GHb: 1) the mediator variable (the fear of blood and injury) affects the number of blood glucose measurements per day ($R = 0.28$; $F_{3,98} = 2.86$; $P = 0.04$); 2) the number of blood glucose measurements per day affects GHb ($R = 0.21$; $F_{1,100} = 4.41$; $P = 0.038$); 3) GHb is significantly related to the fear of blood and injury ($R = 0.23$; $F_{1,100} = 5.54$; $P = 0.02$); 4) both independent variables affect the dependent variable and the effect of the fear of blood and injury is greater ($t = 2.24$) than that of the number of blood glucose measurements per day ($t = -1.97$) (multiple $R = 0.30$; $F_{2,99} = 4.8$, $P = 0.01$); and finally, 5) the best relationship was found between GHb and the number of blood glucose measurements per day, adjusted on the fear of blood and injury ($R = 0.27$; $F_{1,95} = 7.72$; $P = 0.007$ with $y = 8.31 (e^{-0.06x})$).

CONCLUSIONS— This cross-sectional study in type I diabetic patients shows that poor glycemic control is associated with higher levels of psychological suffering, phobic symptoms (mainly the fear of blood and injury), and anxiety-depression as evaluated by the Fear Questionnaire. GHb was found to be increased in patients who performed few blood glu-

cose measurements per day, and this effect is mediated by the fear of blood and injury.

The frequency of phobic disorders (according to the DSM-IV) is lower in this sample compared with the high frequency of the phobic symptoms as assessed by the Fear Questionnaire. An explanation may come from the fact that the MINI is an observer-rating questionnaire and was designed to screen clinically relevant psychiatric disorders, whereas the Fear Questionnaire is a self-rating questionnaire and may disclose more subtle symptomatology related to everyday life activities.

Patients with poor glycemic control showed higher psychological distress (as assessed by the General Health Questionnaire), and this was positively associated with the level of anxiety and depression. Similarly, Wilkinson et al. (15) found that type I diabetic patients with $HbA_{1c} \geq 11\%$ had a higher score on this questionnaire than those with $\leq 10.9\%$.

The MADRS scores were not different between type I diabetic patients with poor or good glycemic control. Only five patients (9.8%) with GHb $< 8\%$ and eight patients (16%) with GHb $\geq 8\%$ scored in the range of clinically depressed (≥ 15). This suggests that, even among poorly controlled patients with type I diabetes, only a small subgroup seems to have current depression with clinically meaningful depression scores.

The fear of blood and injury in adults usually dates back to childhood, and patients with the fear of blood and injury often have family members with similar problems (16). Patients with type I diabetes may represent a specific population that is quite different from psychiatric patients: regular home blood glucose monitoring and insulin injections may be specific elicitors of the fear of blood and injury (16). Further prospective studies are needed to assess the importance of the fear of blood and injury in patients with type I diabetes.

In conclusion, this study shows that type I diabetic adults with poorer metabolic control perform fewer blood glucose measurements per day. This relationship is mediated by the fear of blood and injury. Therefore, diabetes education programs should be directed to disclose and treat this phobic symptom to improve glycemic control.

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