

Psychiatric co-morbidity with type 1 and type 2 diabetes mellitus

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المرض النفسي المشترك مع النمط الأول والثاني من السكري

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الخلاصة: قيم الباحثان انتشار السكري المشترك مع المرض النفسي في المرضى اليونانيين، كما قيما الاختلافات بين النمط الأول والنمط الثاني للسكري ونتائج الاضطرابات النفسية. فمن بين 800 مريض نفسي انطبقت عليهم معايير الإدراج في الدراسة، وجد 82 مريضاً (10.2%) مصابين بالسكري؛ ثمانية وعشرون بالمئة منهم مصابين بالنمط الأول، واثنان وسبعون بالمئة مصابين بالنمط الثاني. وكان متوسط العمر الذي بدء فيه ظهور المرض النفسي أكثر تبكيراً في النمط الأول (المتوسط 26.95 سنة، والانحراف المعياري 9.09 سنوات) مقارنة بالنمط الثاني (المتوسط 33.22 سنة، الانحراف المعياري 10.71 سنوات) ($P > 0.015$)، وكانت مدة عدم معالجة المرض النفسي في النمط الأول أقصر (المتوسط 2.86 سنة، الانحراف المعياري 3.06 سنوات) مقارنة مع (المتوسط 4.13 والانحراف المعياري 6.24 سنوات) للنمط الثاني من السكري. وكان الفصام أكثر التشخيصات النفسية شيوعاً في كلا النمطين من السكري. ولم يوجد اختلاف يُعتد به إحصائياً في نتائج الاضطراب النفسي بين نمطي السكري. وكانت الإصابة بالسكري (بغض النظر عن نمطه)، ومدة عدم معالجة المرض النفسي، وعدم التثقيف العلاجي للمريض هي المنبئات السلبية (غير المرغوبة) للنتائج. وتدلل هذه النتائج على الانتشار المرتفع للسكري بين المرضى النفسيين، وعلى أن الإصابة بالسكري تؤدي إلى آثار ضائرة على نتائج المرض النفسي.

ABSTRACT We evaluated the prevalence of diabetes comorbidity in Greek psychiatric patients, differences between type 1 and type 2 diabetics and the outcome of psychiatric disorder. Of 800 psychiatric patients meeting our inclusion criteria, 82 (10.2%) had diabetes mellitus; 28% type 1 and 72% type 2. The mean age at onset of mental illness was earlier for type 1 diabetics (mean 26.95, SD 9.09 years) than type 2 (mean 33.22, SD 10.71 years) ($P < 0.015$) and the duration of untreated mental illness was shorter (mean 2.86, SD 3.06 years compared with mean 4.13, SD 6.24 years for type 2 diabetics). Schizophrenia was the commonest psychiatric diagnosis in both types of diabetes. There was no significant difference in outcome of psychiatric disorder between the 2 types of diabetics. Existence of diabetes mellitus (regardless of type), duration of untreated mental illness and lack of patient therapeutic education were negative predictors of (unfavourable) outcome. These findings provide evidence of a high prevalence of diabetes in psychiatric patients and that having diabetes has an adverse effect on outcome of psychiatric illness.

Comorbidité psychiatrique et diabète de type 1 et de type 2

RÉSUMÉ Nous avons évalué la prévalence de la comorbidité du diabète chez des patients grecs atteints de troubles psychiatriques, les différences entre les diabétiques de type 1 et de type 2 et l'évolution des troubles psychiatriques. Sur 800 patients atteints de troubles psychiatriques remplissant nos critères d'inclusion, 82 (10,2 %) souffraient de diabète. Parmi eux, 28 % présentaient un diabète de type 1, et 72 % un diabète de type 2. L'âge moyen d'apparition du trouble mental chez les diabétiques de type 1 était inférieur (moyenne 26,95 ; E.T. 9,09 ans) à l'âge moyen d'apparition chez les diabétiques de type 2 (moyenne 33,22 ; E.T. 10,71 ans) ($P < 0,015$) ; la période sans traitement du trouble mental était également plus courte chez les diabétiques de type 1 (moyenne 2,86 ; E.T. 3,06 ans) que chez les diabétiques de type 2 (moyenne 4,13 ; E.T. 6,24). La schizophrénie était le diagnostic le plus fréquent dans les deux types de diabète. Aucune différence significative dans l'évolution du trouble psychiatrique n'a été observée entre les deux types. La présence d'un diabète (quel que soit le type), la période pendant laquelle le trouble mental n'était pas traité et l'absence d'éducation thérapeutique du patient étaient des facteurs prédictifs négatifs d'évolution défavorable. Ces résultats prouvent la prévalence élevée du diabète chez les patients souffrant de troubles psychiatriques et l'effet néfaste du diabète sur leur évolution.

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Introduction

The incidence of diabetes mellitus in psychiatric patients has been found to be 2 to 8 times higher than in the general population [1–3].

A 10% frequency of diabetes mellitus in patients with bipolar disorder (manic and mixed subtypes) has been reported [2]. A study in the United States based on medical records found a prevalence of 26% for diabetes inpatients with bipolar I disorder [4]. A Canadian study found a prevalence of 11.7% of diabetes mellitus in a community-based sample of individuals diagnosed with bipolar disorder [5]. Such figures are significantly greater than the 4% frequency expected in the general population [6].

Other studies suggest that diabetes doubles the risk of depression [7]. The adverse influence of depression on the course of diabetes has been discussed extensively [8]. A randomized control trial found improvements in depression concomitant with improved diabetic control [9]. This link to metabolic control gives depression a unique importance in diabetes.

The association between diabetes and schizophrenia has been a long-standing consideration for those working in the fields of medicine and psychiatry. "Diabetes is a disease which often shows itself in families in which insanity prevails" [10]. This observation reported in 1867, uncomfortably expressed by today's standards, is supported by a more recent study that found that 15.8% of a patients diagnosed with schizophrenia also had a diagnosis of diabetes mellitus [3]. Other literature suggests that type 2 diabetes is 2 to 4 times more prevalent in people with schizophrenia compared to the general population [11,12].

As evidenced by a recent journal supplement devoted entirely to schizophrenia and diabetes [13], research investigating the comorbidity of diabetes and mental illness is pertinent. However,

differences between type 1 and type 2 diabetics with psychiatric disorders have rarely been considered by previous research.

We therefore sought to i) evaluate the prevalence of the comorbid diabetes in a sample of Greek psychiatric patients and (ii) determine if differences in demographic characteristics, clinical profile and outcome of psychiatric disorder in the sample were associated with type of diabetes.

Methods

Sample

Data were collected from all consecutive voluntarily and involuntarily admissions (3124 patients) to the Kastalia hellinikon Psychiatric Clinic in Athens in Greece during the study period 2001–2006. Inclusion criteria were: age ≥ 18 years (to enable psychiatric diagnosis based on DSM-IV [14]); no treatment drop-out before completion of the inpatient treatment phase; and an absence of mental retardation, alcoholism or neurological illness.

Only the 800 (25.6%) patients who fitted the selection criteria were evaluated for the presence of the comorbid condition of diabetes mellitus. A diagnosis of diabetes mellitus was based on clinical signs, as observed by a diabetologist, and a fasting venous plasma glucose (FPG) level >140 g/dL on at least 2 separate occasions during hospitalization. The cut-off of 140 g/dL was used to have a clear diagnosis is diabetes.

The final sample consisted of 82 (10.2%) psychiatric patients who were found to have diabetes mellitus. This sample was further categorized on the basis of diabetes type (1 or 2), in order to facilitate the identification of any differences between the two types of diabetes and the demographic characteristics and clinical parameters of the patients.

All patients were known to the first author who was part of the team

of clinicians that had supervised their treatment process.

Measures

Psychiatric diagnoses were based on DSM-IV [14] and resulted from clinical interview at admission of the patient to the psychiatric unit. Clinical interviews were designed to gather data about relevant clinical history, including treatment compliance and therapeutic education, current symptoms and sociodemographic characteristics.

Consistent with previous studies [15], duration of untreated mental illness (duration of untreated psychosis) was defined as the time from the onset of psychiatric illness (defined as the time period in which the patient first experienced the signs and symptoms of the diagnosed disorder) to the time when the patient received treatment.

Outcome of psychiatric disorder was measured in terms of the presence of relapse to a new episode, re-hospitalization over a 2-year follow-up period, and degree of symptom remission. Follow-up assessments were conducted by the same clinical team that treated the patients in the hospital. A 2-year follow-up period was chosen as the majority of new episodes occur within 2 years of remission [16]. Poor outcome was defined as the presence of relapse to a new episode or re-hospitalization over the 2-year follow-up period. A favourable outcome was defined as no relapse within the 2-year follow-up period.

Data obtained from the above measures were supplemented by information obtained from clinical records, referring and treating psychiatrists and interviews conducted with family members of the patients.

Ethical issues

All patients were informed about the nature of the research within the hospital and willingly gave their consent to participate. In fewer than 10 patients we used educational interventions, which according to the literature have

been shown to improve understanding of study information in patients with psychotic and mood disorders [17,18]. Information sheets and preliminary interviews made it clear that the choice to consent or otherwise would have no bearing on the treatment offered.

The project ensured the anonymity of the subjects by replacing patient names with unique identifying numbers before the statistical procedures began.

Statistical methods

A secure computerized database was established and maintained throughout the study. Patient names were replaced with unique identifying numbers.

Statistical analyses were performed using the SPSS, version 10.0 for Windows. Data are presented as mean and standard deviation (SD) for continuous variables and frequencies for categorical variables. Differences between type 1 and type 2 diabetics were analysed by the Pearson chi-squared test for discrete variables (sex, education, marital status, employment status) and *t*-tests for continuous variables (age, age at onset of psychiatric symptoms, number of admissions, duration of untreated mental illness). Multiple regression analysis was used to determine the predictors of outcome of mental illness.

Results

Demographics and prevalence

Of the 800 psychiatric patients, 82 (10.2%) had diabetes as a comorbid condition. Type 2 diabetes was the most prevalent type in 59 (72%) patients while the remaining 23 (28%) was classified as type 1 diabetes.

As reflected in Table 1, type 1 diabetics were typically younger in age (mean 35.21, SD 10.72) than type 2 diabetics (mean 46.08, SD 9.01 years), a statistically significant difference ($t = 4.64$, $df=80$, $P < 0.0001$). The mean age at onset of mental illness for type 1 diabetics was earlier (mean 26.95, SD 9.09

years) than for type 2 diabetics (mean 33.22, SD 10.71 years) ($t = 2.48$, $df=80$, $P < 0.015$). The duration of untreated mental illness was shorter for type 1 diabetics (mean 2.86, SD 3.06 years) compared to type 2 diabetics (mean 4.13, SD 6.24 years). The duration of untreated mental illness was positively correlated with the age of diabetics at study entry ($r = 0.21$, $P < 0.05$), but not with their age at onset of psychiatric symptoms.

Table 2 gives the demographic characteristics of the patients with psychiatric illness and comorbid diabetes according to type of diabetes. There were no statistically significant differences between psychiatric patients with type 1 and 2 diabetes in terms of sex, education or marital status but there was a significant difference for employment with more patients with type 1 diabetes being unemployed ($P < 0.03$).

Table 3 shows that schizophrenia was the most prevalent psychiatric diagnosis in both types of diabetes (53.2% of psychiatric patients with type 1 diabetes had schizophrenia and 43.4% with type 2 had schizophrenia).

As regards timing of diagnosis, 49.3% of the patients (81% type 1 and 37% type 2) had been diagnosed with diabetes mellitus before their first psychiatric hospitalization. In 29.6% of type 1 patients the onset of diabetes was almost at the same time as the onset of mental illness, with diabetes preceding mental illness by less than 6 months. In 31.5% of type 2 patients, mental illness preceded diabetes onset by more than 4 years. This was a statistically significant difference between type 1 and type 2 diabetes ($\chi^2 = 36.46$, $df = 7$, $P < 0.001$).

Outcome of psychiatric illness

As regards readmissions, 34.6% of the patients had 3 or more admissions to any psychiatric hospital (33.3% type 1 and 35.2% type 2), 16% had 2 admissions (14.3% type 1 and 16.7% type 2) and 21.7% of type 1 and 13.6% of type 2 diabetics were readmitted at least once

over the 12-month follow-up period. There were no significant differences between the 2 diabetes groups in the number of readmissions ($t = 0.14$, $df = 80$, $P > 0.05$).

The main reason for readmission was the patient's non-compliance with psychiatric medication (35%). The second reason was poor diabetes control before the reappearance of a new mental illness episode (30%). About half of the diabetics (52.2% type 1 and 55.9% type 2) were readmitted to the hospital at some point in their lives. The majority of the type 2 diabetics (52%) had poorer diabetes control during the relapse of their psychiatric illness.

As regards compliance, 41.4% of our patients were non-compliant with psychiatric treatment while 25.4% adhered to diabetes treatment (regular visits to the diabetologist and controlled blood glucose levels). Only 20% type 1 and 8.5% type 2 patients had had any therapeutic patient education about diabetes.

Table 4 shows the results of the multiple regression analysis used to identify predictors of outcome within 2 years. Only the provision of therapeutic patient education was identified as a positive predictor of (favourable) outcome. The duration of untreated mental illness and the existence of diabetes (regardless of type) were negative predictors of (unfavourable) outcome of the mental illness.

Discussion

Prevalence of diabetes comorbidity

The present study confirmed the higher prevalence of diabetes in psychiatric patients (10.2%) than found in the general population, adding weight to the proposition that this may be a universal phenomenon [3]. Epidemiological studies [19] have typically established higher prevalence rates (15%–30%) of diabetes in psychiatric patients than

Table 1 Age and psychiatric characteristics of patients with psychiatric illness and comorbid diabetes mellitus

Characteristic	Type 1 (n = 23)		Type 2 (n = 59)		Statistics
	Mean	SD	Mean	SD	
Age (years)	35.21	10.72	46.08	9.01	$t = 4.64$, $df = 80$, $P < 0.0001$
Age at onset of psychiatric symptoms (years)	26.95	9.09	33.22	10.71	$t = 2.48$, $df = 80$, $P < 0.015$
Number of admissions	2.34	1.66	2.42	2.46	$t = 0.14$, $df = 80$, $P > 0.05$
Duration of untreated mental illness (years)	2.86	3.06	4.13	6.24	$t = -1.24$, $df = 75.68$, $P > 0.05$

SD = standard deviation.

our investigation. This may be due to the fact that our sample consisted of inpatients only and therefore excluded those patients with milder psychiatric symptoms. In addition, the method of participant recruitment (e.g. formal diagnostic criteria, audit of medical records) may have eliminated a proportion of false positives that may have been included in studies conducted in more naturalistic, outpatient settings. Putting aside the magnitude of the prevalence, it is clear that our study, along with numerous others [1–3], highlights

the disproportionate prevalence of diabetes in individuals with psychiatric diagnoses.

Psychiatric diagnosis and diabetes comorbidity

Schizophrenia was the most common psychiatric diagnosis with diabetes (both type 1 and type 2). This finding contrasts with reports that identified depression [19]. This difference may be accounted for by the fact that our sample was obtained from an inpatient psychiatric setting and therefore more

likely to have more severe psychiatric conditions.

Differences between type 1 and type 2 diabetes

In our study, type 1 diabetes patients were more likely to be diagnosed with diabetes prior to their psychiatric hospitalization (81%) and type 2 diabetes patients more likely to be diagnosed with diabetes after hospitalization (68%). It has been suggested that, in the case of type 2 diabetes, one should consider the possibility of “neuroleptic-induced

Table 2 Demographic characteristics of patients with psychiatric illness and comorbid diabetes mellitus

Characteristic	Type 1 (n = 23)		Type 2 (n = 59)		Statistics
	No.	%	No.	%	
Sex					$\chi^2 = 0.76$, $df = 1$, $P > 0.05$
Male	12	52.2	37	62.7	
Female	11	47.8	22	37.3	
Education					$\chi^2 = 5.28$, $df = 5$, $P > 0.05$
Primary school	3	13.0	10	16.9	
Junior high school	4	17.4	19	32.2	
Senior high school	9	39.1	16	27.1	
College	2	8.7	1	1.7	
University	5	21.7	13	22.0	
Marital status					$\chi^2 = 5.35$, $df = 6$, $P > 0.05$
Single	13	56.5	21	35.6	
Married	6	26.1	27	45.8	
Divorced	2	8.7	7	11.9	
Widowed	2	8.7	4	6.8	
Employment status					$\chi^2 = 10$, $df = 4$, $P < 0.03$
Unemployed	7	30.4	10	16.9	
Full time employment	8	34.8	26	44.1	
Student	3	13.0	1	1.7	
Housewife	5	21.7	12	20.3	
Early retirement due to psychiatric illness	–	–	10	16.9	

Table 3 Frequency of type 1 and 2 diabetes in patients with psychiatric disorders

Psychiatric diagnosis	Type 1 diabetes		Type 2 diabetes	
	No.	%	No.	%
Schizophrenia	12	52.2	25	42.4
Schizoaffective	1	4.3	5	8.5
Major depression	4	17.4	18	30.5
Bipolar II – depression phase	1	4.3	2	3.4
Bipolar II – mania phase	5	21.7	9	15.3

diabetes” where psychotropic medication may further increase the risk of the development diabetes, either directly or as a result of iatrogenic weight gain [2]. This issue has been the focus of much recent research [12,20–22]. Literature supports an association between the use of antipsychotic medication and impaired glucose metabolism, however methodological weaknesses abound and prospective randomized trials are required [23].

Given that type 1 diabetes was once called ‘juvenile diabetes’, it was not surprising that type 1 diabetics in the present study were significantly younger than type 2 diabetics. This factor may explain many of the significant findings in contrasting type 1 and type 2 diabetics. Type 1 diabetics characteristically have an onset earlier in their life span than type 2, have a greater tendency for the need for insulin at an earlier age and have a shorter life expectancy. As a consequence of the vicissitudes of their illness, it is perhaps understandable that

type 1 diabetics may experience obstacles in pursuing relationships, marriage, education and employment. This finding adds weight to the assertion made by other researchers that type 1 young diabetic patients should be seen more as a high-risk group for psychiatric disorders than the patients of most other chronic medical conditions [1].

Predictors of outcome of psychiatric illness

There was no significant difference in the course of psychiatric illness over a 2-year follow-up period between those with type 1 or type 2 diabetes, as indicated by the non-significant difference in the number of psychiatric rehospitalizations.

The existence of diabetes mellitus (regardless of type), the duration of untreated mental illness and the lack of patient therapeutic education were negative predictors of outcome in the present study. Given that comorbidity of disorders adds to treatment complexity and is frequently associated with

chronicity [24], it is not surprising that diabetes negatively affects the course of psychiatric disorder.

Diabetes affects all aspects of everyday life and diabetics bear much of the responsibility for treatment decisions that will affect their immediate and long-term health but less than half of our patients had been exposed to therapeutic patient education and psychoeducational interventions. Therapeutic patient education aims to inform patients adequately about their chronic disorders in order to manage and take responsibility for their condition. Psychotherapeutic patient education can help patients to deal with the insecurity they suffer from and give the appropriate answers to their questions. Such education has brought about a significant decrease in the number of hospital admissions of patients with diabetic coma [25]. In the present study, a lack of therapeutic patient education was related to poor outcome of mental illness.

Table 4 Regression analysis for variables predicting outcome of mental illness^a

Variable	Unstandardized coefficient		Standardized coefficient
	B	SE	Beta
Sex	4.80	2.88	0.05
Diagnosis	0.24	0.83	0.00
Age at onset of psychiatric symptoms	-6.59	0.17	-0.00
Duration of untreated mental illness	-1.99	0.39	-0.15**
Marital status	-0.46	1.31	-0.1
Psychoeducation	43.5	2.87	0.48**
Diabetes mellitus	-0.10	0.04	-0.06*

* $P < 0.05$; ** $P < 0.01$.^aOutcome (dependent) variable = number of months after treatment that the patient relapsed.

SE = standard error.

A large proportion of our patients (41.4%) in our study were non-compliant with psychiatric treatment. Interestingly, 25.4% adhered to diabetic treatment (regular visits to the diabetologist and controlled blood glucose levels) but were non-compliant with their psychiatric treatment after discharge from the psychiatric unit. The fact that patients compliant with diabetes treatment were not always compliant with psychiatric treatment may be because of denial of a psychiatric disorder in order to avoid stigmatization. Research evidence suggests that stigma has a significant effect on the lives of people with mental illness [26]. There is no stigma associated with high blood pressure or diabetes, but there is stigma associated with being mentally ill [26].

The significance of the duration of untreated mental illness, the third negative predictor of outcome, concurs with the vast majority of studies that have correlated early treatment with better outcome [27]. In our study, the duration of untreated mental illness was shorter for type 1 diabetics compared with type 2 patients. Again, stigma may prevent people from seeking immediate

professional intervention and consequently increase the duration of untreated psychosis, which has a negative impact on the course of the chronic disease [28].

Limitations

The present study was limited by the fact that the sample comprised of psychiatric inpatients only. Thus our findings relate to patients suffering more severe forms of psychiatric illness as the participants comprised those admitted, involuntarily in many cases, to a psychiatric hospital. A more representative sample of psychiatric patients would also include outpatients.

Certain crucial variables, such as the onset of psychiatric illness, could not be measured by standardized instruments. Such variables were assessed by the clinical team and were based on patient and family member reports and records of treating facilities.

Clinical implications

The proportion of diabetes as the comorbid condition in our psychiatric population was almost 3 times higher than that expected in the general

population [1–3,19]. Although there is significant variation in the comorbid prevalence of diabetes in psychiatric patients, this prevalence is consistently higher than would be expected in the general population.

Psychiatric patients with comorbid type 1 diabetes had a differential profile than those with comorbid type 2 diabetes. Type 1 diabetics tended to be younger at age of onset of the psychiatric disorder, single, have a diagnosis of either schizophrenia or bipolar II (manic phase). Type 1 diabetes typically preceded mental illness by less than 6 months. Type 2 diabetics tended to be older at age of onset of the psychiatric disorder, were married and had a diagnosis of schizophrenia or depression.

There was no significant difference in the outcome of the psychiatric disorder in patients with type 1 or type 2 diabetes as the comorbid condition. The existence of diabetes mellitus (regardless of type) and the duration of untreated mental illness were negative predictors of (unfavourable) outcome psychiatric disorders while provision of patient therapeutic education was positive predictor of (favourable) outcome.

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Mental health and development: targeting people with mental health conditions as a vulnerable group

People with mental health conditions have been excluded from the development agenda despite being a marginalized and vulnerable group in countries all over the world. This report, *Mental health and development: targeting people with mental health conditions as a vulnerable group*, highlights the urgent need to redress this situation. It presents compelling evidence that people with mental health conditions meet major criteria for vulnerability and yet fall through the cracks of development aid and government attention. It makes the case for reaching out to this vulnerable group through the design and implementation of appropriate policies and programmes and through the inclusion of mental health interventions into broader poverty reduction and development strategies. It also describes a number of key interventions that can provide a starting point for these efforts. The report is a call to action to all development stakeholders – multilateral agencies, bilateral agencies, global partnerships, private foundations, academic and research institutions, governments and civil society – to focus their attention on mental health. By investing in people with mental health conditions, development outcomes can be improved.

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