DIABETICMedicine

DOI: 10.1111/j.1464-5491.2008.02648.x

Original Article: Psychology

Anxiety and depression symptoms in patients with diabetes

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Accepted 21 November 2008

Abstract

Aims To identify the prevalence and major determinants of anxiety and depression symptoms in patients with diabetes.

Methods A cross-sectional study of 2049 people with Types 1 and 2 diabetes, selected from patients experiencing three different models of care in Ireland: (i) traditional mixed care; (ii) hospital/general practitioner (GP) shared care; (iii) structured GP care. Anxiety and depression symptoms were assessed with the Hospital Anxiety and Depression Scale (HADS). Analyses were conducted primarily using logistic regression with adjustment for relevant confounders.

Results The overall response rate was 71% ($n = 1456$). Based on the HADS, there was evidence of high levels of anxiety and depression symptoms in patients with diabetes; 32.0% (95% confidence interval = 29.5–34.6%) exceeded the HADS cut-off score of 'mild to severe' anxiety and 22.4% (95% confidence interval = 20.2–24.7%) exceeded the HADS cut-off score of 'mild to severe' depression. Diabetes complications, smoking, uncertainty about glycaemic control and being an ex-drinker or a heavy drinker were risk factors for both higher anxiety and depression scores in multivariate analysis. Female gender and poor glycaemic control were risks factors associated only with higher anxiety scores. Higher socio-economic status and older age were protective factors for lower anxiety and depression scores. Type of diabetes, insulin use, marital status and models of care were not significant predictors of anxiety and depression scores.

Conclusions The prevalence of anxiety and depression symptoms in patients with diabetes is considerably higher than in general population samples. These data serve as a benchmark for the prevalence of anxiety and depression symptoms in patients with diabetes.

Diabet. Med. 26, 153–161 (2009)

Keywords Anxiety, Depression, Diabetes

Abbreviations GP, general practitioner; HADS, Hospital Anxiety and Depression Scale; OR, odds ratio

Introduction

Patients with diabetes are almost twice as likely to suffer from anxiety and depression as the general population [1,2]. Egede and Zheng [3] found the following factors to be independently associated with a major depressive disorder in a large national sample of individuals with diabetes: younger age (< 64 years), female gender, completion of at least secondary higher cycle education, lower socio-economic status, perceived decrease in health status and smoking. Poorer glycaemic control is also associated with depression [4]. The patient's motivation to eat, exercise, take medication, test glucose levels and maintain a normal body weight all vie with life's other motivations. Depressed and anxious individuals are less likely to comply with the added burden of diabetes self-care recommendations and are less physically active, less likely to follow their dietary regimen and less likely to take prescribed medications [5,6]. Management of depression in patients with diabetes may be beneficial. Evidence from several controlled trials suggests that detection and treatment of depression improves glycaemic control [7–9].

In the present cross-sectional study, we estimated the prevalence of anxiety and depression symptoms, as assessed by the Hospital Anxiety and Depression Scale (HADS) in a large reference sample of patients with diabetes. We have also

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included risk and protective factors associated with these symptoms in patients with diabetes.

Patients and methods

Study setting and sample

We carried out a cross-sectional study of 2049 people 20 to 75 years of age with a confirmed diagnosis at least 6 months prior to the start of the study of Type 1 or 2 diabetes, selected from patients experiencing three different models of care in different regions of Ireland: (i) traditional mixed care with standard referral and discharge letters between primary and secondary care, patients attending hospital-based clinics on an annual basis and without general practices running diabetes miniclinics ($n = 1245$); (ii) hospital/general practitioner (GP) shared care with the appointment of a community-diabetes nurse specialist, local clinical guidelines, protocols and quality assurance systems, annual hospital-based review and communication between the primary–secondary interface facilitated by the community-diabetes nurse specialist ($n = 225$); (iii) structured GP care supported by the area Health Service Executive with the appointment of a primary care diabetes liaison nurse, local clinical guidelines, protocols and quality assurance systems, practice visits by community-based dieticians and chiropody services, but without a local specialist diabetes unit [10,11] ($n = 579$).

The study was approved by the Clinical Research Ethics Committee of the Cork Teaching Hospitals and the Irish College of General Practitioners Ethics Committee. All patients gave written informed consent. This was a postal survey and all socio-demographic and clinical data were patient reported. Upon receipt of the completed questionnaires, the patient-reported data from the questionnaire packs were scanned into the high specification Formic Scan™ (Formic Ltd, London, UK) data scanning system and downloaded to the Statistical Package for the Social Sciences (SPSS; SAS Institute, Cary, NC, USA) for subsequent analysis.

Instrument used

Anxiety and depression symptoms were assessed with the HADS, designed to measure the cognitive symptomatology of depressed mood and anxiety [12]. The HADS is a well-validated measure and has been used extensively in other chronic disease populations; however, there are little published data in patients with diabetes [13]. The HADS was developed by Zigmond and Snaith in 1983 to provide clinicians and scientists with a reliable, valid and practical screening tool for identifying the two most common forms of psychological distress in medical patients, anxiety and depression [14,15,16]. The scale consists of 14 items and measures two constructs, anxiety and depression with cut-off points for severity (scores: 0–7 normal; 8–10 mild; 11–14 moderate; and 15–21 severe) [14,15].

Statistical analysis

The prevalence of anxiety and depression symptoms were estimated using the HADS cut-off points for 'mild to severe' anxiety and depression scores (scores 8–10 mild, 11–14 moderate and 15–21 severe).

Non-parametric Mann–Whitney *U*-test and the Kruskal–Wallis test were used to compare the levels of anxiety and depression in different subgroups of patients with diabetes. The anxiety and depression scores were dichotomized by the following cut-off points prior to regression analyses: 8–21 for mild to severe anxiety/depression scores vs. 0–7 for a normal score. The odds ratios (OR) for mild to severe anxiety and depression were estimated using logistic regression with adjustment for relevant confounders. Hosmer–Lemeshow goodness of fit was run on the fully adjusted anxiety and depression models to check for an adequate fit of the data. In the logistic regression analyses, the effect of adjustment for age and gender are shown separately from the fully adjusted model to enhance the transparency of the analysis.

Results

Response rate

The overall response rate was 71% ($n = 1456$). However, there were differences in response rate across the models of care, with structured GP shared care reporting the highest response rate of 72.4% ($n = 419$), followed by traditional mixed care of 71.6% ($n = 892$) and hospital/GP shared care of 64.4% ($n = 145$).

Prevalence of anxiety and depression

The majority of patients had a 'normal score' (≤ 7) 68.0% for anxiety and 77.6% for depression. The prevalence of 'mild', 'moderate' and 'severe' anxiety and depression scores, by gender and diabetes type are presented in Table 1. Of the 1227 participants responding to the anxiety and depression questions in HADS, 211 scored above the HADS cut-off for both anxiety and depression; 17.2% (95% confidence interval = 15.2–19.5%). The prevalence of 'mild' anxiety in females with Type 1 diabetes was more than double that of females with Type 2 diabetes, and men with Type 1 diabetes experienced slightly more 'moderate' to 'severe' anxiety compared with men with Type 2 diabetes. We also found slight differences in depression symptoms between type and gender: males with Type 1 diabetes experiencing more 'moderate' depression symptoms compared with males with Type 2 diabetes. There was no difference in the prevalence for 'mild', 'moderate' and 'severe' anxiety and depression scores in Type 2 patients using insulin compared with those not using insulin. There were no differences in the prevalence of mild anxiety and depression across the three models of care. However, compared with the structured GP care group, the prevalence of moderate and severe anxiety and depression was higher in the hospital/GP shared care group: moderate anxiety 14.9 vs. 8.0%; severe anxiety 5.9 vs. 4.1%; moderate depression 10.6 vs. 5.3%; severe depression 2.3 vs. 0.8%. There were no differences in the prevalence of 'mild' anxiety and depression scores across these models of care.

Table 1 Prevalence of Hospital Anxiety and Depression Scale (HADS) normal and mild to severe anxiety and depression scores in patients with Types 1 and 2 diabetes (n = 1456)*

	Anxiety scores, n (%)						Depression scores, n (%)					
	Overall	95% CI	Female (Type 1)	Male (Type 1)	Female (Type 2)	Male (Type 2)	Overall	95% CI	Female (Type 1)	Male (Type 1)	Female (Type 2)	Male (Type 2)
Mild (8–10)	219 (16.9)	14.9–19.1	33 (27.3)	23 (15.8)	64 (10.5)	99 (16.2)	161 (12.3)	10.6–14.2	16 (13.1)	18 (12)	52 (12.3)	75 (12.2)
Moderate (11–14)	133 (10.3)	8.7–12.1	13 (10.7)	15 (10.3)	59 (14.1)	46 (7.6)	104 (8.0)	6.6–9.5	9 (7.4)	14 (9.3)	41 (9.7)	40 (6.5)
Severe(15–21)	62 (4.8)	3.7–6.1	8 (6.6)	7 (4.8)	24 (5.7)	23 (3.8)	28 (2.1)	1.4–3.1	1 (0.8)	2 (1.3)	9 (2.1)	16 (2.6)

*Number (n) for individual variables will vary because of missing values.
CI, confidence interval.

Table 2 shows the socio-demographic and health status characteristics by models of care and clearly illustrates that the patients in the hospital/GP shared care model are younger, employed and more educated compared with those in the traditional mixed care and structured GP care models.

Anxiety

Table 3 shows HADS anxiety scores by socio-demographic and health variables in patients with diabetes. Protective factors significantly associated with lower HADS anxiety scores in univariate analysis were older age, structured GP care, private medical insurance and individuals who perceived their glycaemic control to be 'about right'. Female gender, diabetes complications, insulin use, unemployment, smoking, heavy drinking or being an ex-drinker were risk factors significantly associated with higher HADS anxiety scores. Type of diabetes and marital and educational status were not significantly associated with anxiety.

Table 4 summarizes the findings from logistic regression analysis on the major determinants of higher-than-average HADS anxiety scores (cut-off points: 8–21 for mild to severe anxiety scores vs. 0–7 for a normal score). In the fully adjusted model, private medical insurance and older age were significant predictors of lower HADS anxiety scores, while diabetes complications, not knowing if glycaemic control was within the target range, and poor perceived glycaemic control were significant predictors for higher HADS anxiety scores. Type of diabetes and marital and educational status were not significantly associated with HADS anxiety scores.

Depression

Table 5 shows HADS depression scores by socio-demographic and health variables in patients with diabetes. As with anxiety, the following factors were associated with HADS depression scores in univariate analysis: structured GP care, private medical insurance and individuals reporting 'about right' for their perceived glycaemic control were associated with lower HADS depression scores; and diabetes complications, unemployment, smoking, heavy drinking or being an ex-drinker were associated with higher HADS depression scores. We found differences between anxiety and depression for the following factors: younger age and female gender were not associated with higher depression scores and lower educational attainment was associated with a higher HADS depression score. As with anxiety, type of diabetes and marital status were not significantly associated with HADS depression scores.

Table 6 summarizes the findings from logistic regression analysis on the major determinants of higher-than-average HADS depression scores (cut-off points: 8–21 for mild to severe depression scores vs. 0–7 for a normal score).

As with anxiety, private medical insurance and older age were significant predictors of lower HADS depression scores, while diabetes complications were significant predictors of

Table 2 Socio-demographic and health status characteristics by models of care in patients with Types 1 and 2 diabetes ($n = 1456$)*

Characteristic	Traditional mixed care, *n** (%)	Hospital/GP shared care, *n** (%)	Structured GP care, *n** (%)	*P* value
Model of care	892 (61.3)	145 (10.0)	419 (28.8)	
Gender				
Males	511 (57.3)	90 (62.9)	241 (57.5)	
Females	381 (42.7)	53 (37.1)	178 (42.5)	0.44
Age (years)				
20–39	81 (9.2)	15 (11.2)	25 (6.0)	
40–59	338 (38.2)	52 (38.8)	156 (37.4)	
≥ 60	465 (52.6)	67 (50.0)	236 (56.6)	0.20
Marital status				
Married	602 (67.9)	76 (53.5)	288 (69.4)	< 0.001
Employment status				
Employed	268 (31.6)	59 (43.4)	151 (37.2)	< 0.01
Education				
Primary/secondary lower cycle	587 (71.3)	77 (58.3)	276 (70.4)	
Secondary higher cycle	139 (16.9)	23 (17.4)	65 (16.6)	
Third level	76 (9.2)	20 (15.2)	43 (11.0)	
Postgraduate	21 (2.6)	12 (9.1)	8 (2.0)	< 0.001
Health service coverage				
Medical card only	475 (62.8)	69 (59.0)	197 (59.2)	
Private medical insurance + medical card	107 (14.2)	16 (13.7)	37 (11.1)	
Private medical insurance only	174 (23.0)	32 (27.4)	99 (29.7)	0.16
Type of diabetes				
Type 1	219 (24.6)	25 (17.2)	52 (12.4)	
Type 2	673 (75.4)	120 (82.8)	367 (87.6)	< 0.001
Insulin use	328 (39.3)	39 (30.2)	92 (23.4)	< 0.001
Diabetes complications				
None	231 (25.9)	46 (31.7)	131 (31.3)	
One	212 (23.8)	449 (50.3)	24 (16.6)	
Two or more	75 (51.7)	106 (25.3)	182 (43.4)	0.03

*Number (*n*) for individual variables will vary because of missing values.
†*P* value obtained with Mann–Whitney *U*-test or Kruskal–Wallis test as appropriate.
GP, general practitioner.

higher HADS depression scores in the fully adjusted model. Type of diabetes and marital status were not significantly associated with HADS depression scores. In contrast to the findings on anxiety, not knowing if glycaemic control was within the target range and poor perceived glycaemic control were not significantly associated with HADS depression scores.

Discussion

Prevalence estimates of anxiety and depression symptoms in general population samples are approximately 15.3% for anxiety and 10.4–11.2% for depression, based on the threshold cut-off point of 8 for 'mild' HADS anxiety and depression scores [17–19]. The prevalence of anxiety and depression symptoms in patients with diabetes in our study was more than double the general population estimates. Our findings are similar to those from other studies using the HADS questionnaire in patients with diabetes [13,20]: 32.0% of the patients exceeded the HADS threshold cut-off score of 'mild to severe' anxiety and 22.4% exceeded the HADS threshold cut-off score of 'mild to severe' depression.

Lloyd *et al.* found a significant association between depression and poor glycaemic control in men [13]. In the current study, we found an association between poor perceived glycaemic control and higher HADS anxiety and depression scores. However, a patient's perceived control is not necessarily in line with their actual glycated haemoglobin (HbA_{1c}). Patients with diabetes complications in our study experienced higher levels of anxiety and depression, which is consistent with previous work [13,21–23]. However, it should be noted that there were differences in the instruments used and/or methodology in previous studies compared with this study. Peyrot and Rubin [23] and Hermanns *et al.* [21] used instruments which covered a broader range of symptoms than the HADS instrument. Additionally, the patients of Hermanns *et al.* who screened positive received a diagnostic interview [21]. Peyrot and Rubin also followed up with their patients at three different time points and found that, at the 6-month follow-up, the levels of depression and anxiety symptoms were lower for most patients, suggesting

Table 3 Hospital Anxiety and Depression Scale (HADS) anxiety score by health and socio-demographic variables in patients with Types 1 and 2 diabetes ($n = 1456$)*

Variable	*n*	Mean/(SD)	Median	Interquartile range	*P* value†
Gender					
Male	751	5.43 (4.22)	5.00	2.00–8.00	
Female	540	6.50 (4.50)	6.00	3.00–9.00	< 0.001
Age (years)					
20–39	113	6.72 (4.65)	6.00	3.00–9.00	
40–59	503	6.54 (4.49)	6.00	3.00–9.00	
≥ 60	658	5.25 (4.14)	5.00	2.00–8.00	< 0.001
Marital status					
Married	856	5.79 (4.40)	5.00	2.00–8.00	
Single	208	5.95 (4.33)	6.00	2.00–8.75	
Divorced/separated	86	6.86 (4.29)	6.50	4.00–9.00	
Widowed	133	5.63 (4.19)	5.00	2.00–8.00	0.11
Employment status					
Unemployed	803	6.20 (4.53)	6.00	2.00–9.00	
Employed	437	5.28 (3.97)	5.00	2.00–8.00	< 0.01
Health services coverage					
Medical card only	642	6.59 (4.68)	6.00	3.00–9.00	
Private insurance + medical card	136	5.23 (3.98)	4.50	2.00–7.00	
Private insurance only	286	4.62 (3.51)	4.00	2.00–7.00	< 0.001
Educational status					
Primary/secondary lower cycle	824	5.99 (4.53)	5.00	2.00–9.00	
Secondary higher cycle	211	5.35 (4.02)	5.00	2.00–8.00	
Third level	134	5.57 (3.88)	5.00	2.00–8.00	
Postgraduate	38	5.50 (3.81)	5.00	2.00–9.00	0.44
Type of diabetes					
Type 1	267	6.21 (4.38)	6.00	3.00–9.00	
Type 2	1026	5.79 (4.36)	5.00	2.00–8.00	0.12
Treatment regimen					
Diet/oral medication	790	5.72 (4.46)	5.00	2.00–8.00	
Insulin	420	6.30 (4.27)	6.00	3.00–9.00	< 0.01
Complications					
None	359	4.91 (3.95)	4.00	2.00–7.00	
One	306	5.30 (4.09)	5.00	2.00–8.00	
Two or more	628	6.72 (4.57)	6.00	3.00–9.00	< 0.001
Perceived glycaemic control					
'About right'	509	4.88 (4.03)	4.00	2.00–7.00	
Too high	255	6.52 (4.45)	6.00	3.00–9.00	
'Don't know'	267	6.49 (4.25)	6.00	3.00–9.00	< 0.001
Smoking status					
Never smoker	515	5.54 (4.25)	5.00	2.00–8.00	
Ex-smoker	540	5.53 (4.09)	5.00	2.00–8.00	
Smoker	216	7.59 (4.99)	7.00	4.00–11.00	< 0.001
Drinking status					
Light to moderate drinker	587	5.51 (4.10)	5.00	2.00–8.00	
Never drinker	272	5.33 (4.28)	5.00	2.00–8.00	
Ex-drinker	225	6.84 (4.64)	7.00	3.00–9.00	
Heavy drinker	73	7.00 (4.79)	6.00	4.00–9.50	< 0.001
Models of care					
Traditional mixed care	780	5.99 (4.37)	5.50	2.00–800	
Hospital/GP shared care	135	6.62 (4.70)	6.00	3.00–9.00	
Structured GP care	378	5.39 (4.21)	4.00	2.00–8.00	0.01

*Number (*n*) for individual variables will vary because of missing values.
†*P* value obtained with Mann–Whitney *U*-test or Kruskal–Wallis test as appropriate.
GP, general practitioner; SD, standard deviation.

Table 4 Determinants of anxiety (HADS scale 8–21 vs. 0–7) in patients with Types 1 and 2 diabetes

Exploratory variables	OR*	CI (95%)	*P* value	OR†	CI (95%)	*P* value
Gender, female	1.51	1.19–1.92	< 0.01	1.30	0.88–1.94	0.18
Age (years)						
40–59 vs. 20–39	0.85	0.56–1.29		0.48	0.24–0.95	
≥ 60 vs. 20–39	0.52	0.34–0.79	< 0.001	0.23	0.11–0.49	< 0.001
Type 2 diabetes	0.98	0.71–1.35	0.89	0.96	0.60–1.54	0.88
Health services coverage						
Medical card + private insurance vs. medical card	0.51	0.33–0.79		0.35	0.18–0.66	
Private insurance vs. medical card	0.32	0.22–0.46	< 0.001	0.34	0.20–0.57	< 0.001
Education						
Secondary higher cycle vs. primary/secondary lower cycle	0.71	0.50–1.00		1.04	0.62–1.76	
Third level vs. primary/secondary lower cycle	0.81	0.54–1.23		1.53	0.84–2.80	
Postgraduate vs. primary/secondary lower cycle	0.76	0.37–1.59	0.23	2.25	0.84–6.03	0.27
Unemployed vs. employed	1.80	1.34–2.43	< 0.001	0.73	0.45–1.18	0.19
Married vs. unmarried	1.02	0.79–1.32	0.86	1.22	0.82–1.82	0.33
Models of care						
Hospital/GP shared care vs. traditional mixed	1.26	0.84–1.87		1.10	0.56–2.14	
Structured GP care vs. traditional mixed	0.86	0.65–1.13	0.20	1.01	0.67–1.53	0.96
Diabetes complications						
One vs. none	1.40	0.97–2.02		1.48	0.85–2.57	0.02
Two or more vs. none	2.75	2.00–3.78	< 0.001	2.06	1.25–3.39	
Smoking						
Smoker vs. never smoked	1.86	1.33–2.61		1.19	0.70–2.03	
Ex-smoker vs. never smoked	1.06	0.80–1.40	< 0.01	0.89	0.59–1.36	0.56
Drinking						
Never vs. light to moderate drinker	1.16	0.83–1.62		1.39	0.86–2.23	
Ex-drinker vs. light to moderate drinker	1.67	1.20–2.34		1.83	1.15–2.93	
Heavy vs. light to moderate drinker	1.49	0.88–2.52	0.02	1.39	0.63–3.10	0.08
Perceived glycaemic control						
Too high vs. 'about right'	1.88	1.35–2.63		2.00	1.28–3.13	
'Don't know' vs. 'about right'	1.96	1.40–2.73	< 0.001	1.74	1.12–2.69	< 0.01

*Logistic regression model for each variable, adjusted for age and sex only.
†Logistic regression model adjusted for age and sex and all other variables in the table.
CI, confidence interval; GP, general practitioner; HADS, Hospital Anxiety and Depression Scale; OR, odds ratio.

symptoms are subject to changes in personal circumstances [23]. Furthermore, while the prevalence of elevated depression symptoms in patients with diabetes in this current study was higher than in the general population, it was still lower than in the previous studies of Peyrot and Rubin [23] and de Groot *et al.* [24], a finding that may be explained by the fact that the HADS scale addresses many concerns regarding the overestimation of the prevalence of anxiety and depression symptoms in patients with diabetes by omitting physical indicators such as headache or weight loss, symptoms which may be confused with those of other medical conditions such as poorly controlled diabetes [12,15,23,24].

There is evidence from previous work that people with diabetes who smoke are more likely to suffer from depression [25,26]. We found people with diabetes who smoked had higher HADS anxiety and depression scores compared with those individuals who never smoked, while ex-smokers did not differ. We also found people with diabetes who were ex-drinkers or heavy drinkers had significantly higher HADS anxiety and depression scores. This is consistent with the literature on alcohol and mood; alcohol is a central nervous system depressant [27]. Furthermore, Lerman and colleagues explain that individuals with a history of excessive alcohol intake, and in a depressive state, are two to four times more likely not to comply with several of the main diabetes self-care recommendations [28].

Study limitations

There are important limitations to interpreting the results of this study. The cross-sectional study design limits causal inference as a result of uncertainty about the direction of the associations. There were differences in the response rates across the models of care and, although the overall response rate was reasonably high, we cannot exclude the possibility that diabetic patients experiencing anxiety and depression are over-represented in our sample and may introduce potential bias as those who responded possibly experienced symptoms of anxiety and depression. The socio-demographic and clinical data were self-reported by the patients. Ideally, we should have validated the patient-reported information against their medical

Table 5 Hospital Anxiety and Depression Scale (HADS) score by health and socio-demographic variables in patients with Types 1 and 2 diabetes ($n = 1456$)*

Variable	*n*	Mean ± SD	Median	Interquartile range	*P* value†
Gender					
Male	764	4.59 ± 3.97	4.00	1.00–7.00	
Female	544	4.77 ± 3.97	4.00	1.00–7.00	0.41
Age (years)					
20–39	115	4.31 ± 4.21	3.00	1.00–7.00	
40–59s	503	4.86 ± 4.02	4.00	1.00–7.00	
≥ 60	673	4.59 ± 3.88	4.00	2.00–7.00	0.16
Marital status					
Married	871	4.57 ± 3.89	4.00	1.00–7.00	
Single	209	4.45 ± 3.99	3.00	1.00–7.00	
Divorced/separated	87	5.44 ± 4.33	4.00	2.00–8.00	
Widowed	132	5.05 ± 4.06	4.00	2.00–8.00	0.11
Employment status					
Unemployed	813	5.23 ± 4.18	4.00	2.00–8.00	
Employed	446	3.61 ± 3.26	3.00	1.00–5.00	< 0.001
Health services coverage					
Medical Card Only	652	5.53 ± 4.35	5.00	2.00–9.00	
Private insurance + medical card	143	4.05 ± 3.38	3.00	2.00–6.00	
Private insurance only	287	3.37 ± 3.11	2.00	1.00–5.00	< 0.001
Educational status					
Primary/secondary lower cycle	837	4.84 ± 3.99	4.00	1.50–7.00	
Secondary higher cycle	214	3.80 ± 3.63	3.00	1.00–5.00	
Third level	132	4.22 ± 3.56	3.00	1.00–6.00	
Postgraduate	40	3.52 ± 2.92	3.00	2.00–5.00	< 0.01
Type of diabetes					
Type 1	272	4.35 ± 3.90	3.00	1.00–7.00	
Type 2	1038	4.75 ± 3.98	4.00	2.00–7.00	0.12
Treatment regimen					
Diet/oral medication	798	4.49 ± 3.95	3.00	1.00–7.00	
Insulin	428	4.99 ± 4.02	4.00	2.00–7.75	0.02
Complications					
None	360	3.37 ± 3.26	2.00	1.00–5.00	
One	309	4.24 ± 3.74	3.00	1.00–6.00	
Two or more	641	5.60 ± 4.19	5.00	2.00–8.50	< 0.001
Perceived glycaemic control					
'About right'	516	3.88 ± 3.44	3.00	1.00–6.00	
Too high	255	4.87 ± 3.89	4.00	2.00–7.00	
'Don't know'	273	5.18 ± 3.99	4.00	2.00–8.00	< 0.001
Smoking status					
Never smoked	526	4.35 ± 3.89	3.00	1.00–7.00	
Ex-smoker	547	4.47 ± 3.72	4.00	1.00–7.00	
Smoker	215	5.84 ± 4.45	5.00	2.00–9.00	< 0.001
Drinking status					
Light to moderate drinker	592	4.21 ± 3.53	3.00	1.00–6.00	
Never drinker	282	4.49 ± 4.21	3.00	1.00–7.00	
Ex-drinker	220	5.46 ± 4.29	4.50	2.00–8.00	
Heavy drinker	75	5.56 ± 4.48	4.00	2.00–9.00	< 0.01
Models of care					
Traditional mixed care	793	4.91 ± 4.15	4.00	2.00–7.00	
Hospital/GP shared care	133	4.78 ± 4.04	4.00	1.00–7.50	
Structured GP care	384	4.12 ± 3.49	3.00	1.00–6.00	0.03

*Number (*n*) for individual variables will vary because of missing values.
†*P* value obtained with Mann–Whitney *U*-test or Kruskal–Wallis test as appropriate.
GP, general practitioner; SD, standard deviation.

Table 6 Determinants of depression (HADS scale 8–21 vs. 0–7) in patients with Types 1 and 2 diabetes

Exploratory variables	OR*	CI (95%)	*P* value	OR†	CI (95%)	*P* value
Gender, female	1.12	0.86–1.46	0.39	0.98	0.62–1.55	0.93
Age (years)						
40–59 vs. 20–39	1.02	0.63–1.65		0.51	0.22–1.19	
≥ 60 vs. 20–39	0.89	0.55–1.42	0.59	0.29	0.11–0.71	0.01
Type 2 vs. Type 1 diabetes	1.09	0.76–1.58	0.63	0.93	0.54–1.59	0.79
Health services coverage						
Medical card + private insurance vs. medical card	0.44	0.27–0.72		0.52	0.26–1.06	
Private insurance vs. medical card	0.25	0.16–0.38	< 0.001	0.44	0.24–0.82	0.02
Education						
Secondary higher cycle vs. primary/secondary lower cycle	0.52	0.34–0.79		0.78	0.43–1.43	
Third level vs. primary/secondary lower cycle	0.67	0.42–1.09		1.51	0.76–3.02	
Postgraduate vs. primary/secondary lower cycle	0.34	0.12–0.96	< 0.01	0.32	0.04–2.59	0.28
Unemployed vs. employed	2.92	2.06–4.15	< 0.001	0.62	0.35–1.09	0.10
Married vs. unmarried	0.79	0.59–1.04	0.09	1.04	0.66–1.62	0.88
Models of care						
Hospital/GP shared care vs. traditional mixed	1.01	0.65–1.57		0.77	0.34–1.72	
Structured GP care vs. traditional mixed	0.71	0.52–0.97	0.08	0.74	0.45–1.21	0.44
Diabetes complications						
One vs. none	1.85	1.18–2.89		2.83	1.27–6.30	
Two or more vs. none	3.99	2.71–5.89	< 0.001	5.99	2.88–12.46	< 0.001
Smoking						
Smoker vs. never smoked	1.91	1.32–2.75		1.39	0.76–2.51	
Ex-smoker vs. never smoked	1.08	0.79–1.48	< 0.01	0.98	0.60–1.59	0.47
Drinking						
Never vs. light to moderate drinker	1.17	0.80–1.70		1.45	0.84–2.52	
Ex- vs. light to moderate drinker	1.81	1.25–2.61		1.68	0.97–2.88	
Heavy vs. light to moderate drinker	2.22	1.29–3.79	< 0.01	1.73	0.75–4.01	0.19
Perceived glycaemic control						
Too high vs. 'about right'	1.16	0.78–1.73		0.95	0.55–1.64	
'Don't know' vs. 'about right'	1.95	1.36–2.79	< 0.01	1.53	0.94–2.48	0.16

*Logistic regression model for each variable, adjusted for age and sex only.
†Logistic regression model adjusted for age and sex and all other variables in the table—(Hosmer–Lemeshow goodness of fit—model adequately fits the data; $P = 0.44$).
CI, confidence interval; GP, general practitioner; HADS, Hospital Anxiety and Depression Scale; OR, odds ratio.

records but were not able to do so because of time and resource constraints. Smoking and heavy drinking were associated with high anxiety and depression scores, which could be because of reverse causation.

Study implications

Vileikyte and colleagues advocate a more balanced approach to diabetes management, with equal emphasis given to glycaemic control and psychological distress [29]. Our findings support and strengthen the hypothesis that people with diabetes are at a higher risk for experiencing the two most common forms of psychological distress, anxiety and depression. The convincing body of evidence associating depressive disorders with diabetes suggests that patients with diabetes should be screened for anxiety and depression symptoms [1–3,23,30–33]. Lloyd *et al.* have suggested that the HADS instrument is appropriate for use in a clinical setting [13]. Moreover, a randomized controlled trial conducted by Griffiths and colleagues successfully used the HADS instrument to screen patients with Type 2 diabetes for depression [34]. Further testing of the HADS as a screening instrument for anxiety and depressive disorders among patients with diabetes should be considered. However, clinical screening recommendations need to be developed and linked with routine therapies prior to implementation in clinical practice.

In conclusion, the prevalence of 'mild' to 'severe' anxiety and depression as measured with the HADS in patients with diabetes is considerably higher than in general population samples. These data serve as a benchmark for the prevalence of anxiety and depression symptoms in patients with diabetes.

Competing interests

Nothing to declare.

Acknowledgements

We would also like to acknowledge the Health Research Board, Ireland (grant reference number RP/16-/2002) for funding this project; Carmel Brennan, Project Specialist—

Cardiovascular Health, Midlands, HSE; Dr Donal O'Halloran, Consultant Endocrinologist, Cork University Hospital; Dr Siobhan Jennings, Specialist in Public Health Medicine, Eastern HSE Region.

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