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Depression prevalence among diabetic patients and comparison of demographics and complications

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Ethics Committee Approval
Ethics committee approval was obtained from the Clinical Research Ethics Committee of Kartal Dr. Lütfi Kırdar City Hospital, with the decision number 2019/514/156/9, dated 26 June 2019. All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest
No conflict of interest was declared by the authors.

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Abstract

Background/Aim: Living with diabetes brings psychological difficulties for many patients and puts them in a depressed state. This reduces follow-up and treatment compliance and increases anxiety in terms of complications. Incompliance of follow-up and treatment can increase macro and micro complications in patients in a vicious circle. In this respect, clinicians should be careful during the follow-up and treatment of the patients. In this study, our aim was to determine the depression rate among diabetic patients and its relationship with demographic findings and complications.

Methods: Patients who are followed up regularly at our hospital's diabetes clinic between July and August 2019 were included and a case-control study was planned. BDI questions were answered by patients under supervision after obtaining patient consent. Patients with BDI >16 were considered depressed. Demographic characteristics, habits, data about diabetes follow-up, treatments and results of BDI were analyzed. The patients were evaluated in terms of cardiovascular, neurological, and ophthalmologic complications. The control group comprised healthy volunteers without any additional diseases.

Results: A total of 281 patients participated in this study and the depression rate was 66.5%. There were 156 females (55.5%) and 125 males (44.5%). Among them, 60.3% of females and 74.4% of males had depression. The mean blood glucose and HbA1c levels were 151 mg/dl (68-475) and 8 mg/dL (4-14), respectively. Based on BDI, 68% of T2DM patients (n=83) and 50% of T1DM patients (n=11) had depression (P=0.087). Depression rates were 66.7% (n=9) between the ages of 20 and 34 years (P=0.035), 50% (n=36) between the ages of 35 and 49 years, 27.5% (n=138) between the ages of 50 and 64 years, and 32.7% (n=98) over the age of 65 years. The control group (n=50) included 32 females (64%) and the depression rate was 35% (n=17).

Conclusion: Every stage of diagnosis, treatment and follow up of diabetes causes physiological stress in patients, which reflects in their lives. We must consider that depression, a treatable disease, affects the management and treatment of diabetes.

Keywords: Diabetes mellitus, Depression, Beck depression inventory

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Introduction

In 2017, almost half (49.7%) of individuals between the ages of 18-99 years had undiagnosed diabetes mellitus (DM). It is known that the cause of death of approximately 5 million people between the 20-99-year age range is DM. By the year of 2017, the number of patients diagnosed with DM reached 451 million, and it is expected to increase to 693 million by 2045 [1].

Depression is a serious global health problem. The World Health Organization (WHO) predicts that depression will be the second most common cause of DALY (Disability Adjusted Life Years) in 2020. According to the WHO 2017 data, the depression rate in Turkey is 4.4% [2]. Many studies conducted in recent years showed that these two diagnoses are associated [3]. It is thought that 25% of diabetic patients have depression, for which diabetes is a risk factor [4].

DM has psychiatric and psychosocial dimensions. An individual with diabetes faces physical, emotional, social and sexual problems. It is often difficult for DM patients to accept that they have a lifelong disease and lifestyle changes are essential [5-7].

We aimed to evaluate the psychiatric aspects of DM patients due to non-compliance in the treatment, follow-up, and management process. We determined the demographic characteristics of patients, their relationship with micro-macrovascular complications and depression frequency.

Materials and methods

Patients followed up regularly at our hospital's diabetes clinic between July and August 2019 were included in the study. Pregnant women, patients with terminal stage malignancies, systemic diseases with short life expectancy and advanced stage neuropsychiatric disorders were excluded from the study. In this case control study, the control group comprised healthy volunteers without known diseases. Consent of the patients were obtained for the study before routine examinations. The patients were asked to fill in the BDI form. Patients with BDI >16 were considered depressed [8].

All participants were told that their information will be kept confidential. Forms were filled in during examinations, archived in the study file and used for scientific purposes only. Demographic characteristics, habits, data about diabetes follow-up, treatments and results of BDI were analyzed. The patients were evaluated in terms of cardiovascular, nephrological, neurological and ophthalmologic complications. Previous myocardial infarction, CABG surgery or stent history, previous cerebrovascular events or presence of retinopathy were evaluated.

Statistical analysis

SPSS 20 (Statistical Package for Social Sciences) software was used in the statistical analysis of the study. Variables were stated as interquartile range. Categorical variables were presented as numbers and percentage (%) and compared with Pearson's Chi-square test. Student's t-test was used for normally distributed continuous data and Mann-Whitney U test was utilized for non-normally distributed data. *P*-value <0.05 was considered statistically significant. Ethics committee approval was obtained from the Clinical Research Ethics Committee of Kartal Dr. Lütfi Kırdar City Hospital, with the decision number 2019/514/156/9, dated 26 June 2019.

Results

A total of 281 patients participated in this study. Twenty-two patients (7.8%) had T1DM and 259 patients (92.2%) had T2DM. There were 156 females (55.5%), and the depression rate was 66.5%. According to BDI scores, 68% (n=83) of T2DM patients and 50% (*P*=0.087) of T1DM patients had depression (Table 1).

In our study 69.7% (*P*=0.480) of married patients, 46.3% of single patients and 54.3% of widowed/divorced patients had depression. The rate of patients living with their families was 94% (n=264) and 6% (n=17) lived alone. Depression rate was 34.1% (n=90) among those living with their families and 23.5% (*P*=0.438) among those living alone. The rate of smokers was %15.3 (n=43), among which 39.5% were depressed (*P*=0.358) (Table 2).

Table 1: Patients' and Control Group Distribution of Beck Depression Score
Beck Depression Score 0-16 No Depression; Beck Depression Score 17-39 Depression

Beck depression score	n	%
Patient group		
No depression	94	33.5
Depression	187	66.5
Total	281	100
Control group		
No depression	33	66
Depression	17	34
Total	50	100

Table 2: Demographic Information and Predictive Characteristics of Patients to Whom Beck Depression Index Applied

Variable	Category	Beck Depression Test Negative		Beck Depression Test Positive		*P*-value
		Total	%	Total	%	
Gender	Male	32	25.6	93	74.4	0.013
	Female	62	39.7	94	60.3	
Age	20-34	3	33.3	6	66.6	0.035*
	35-49	18	50	18	50	
	50-64	100	72.5	38	27.5	
	65 and +	66	67.3	32	32.7	
Education	Illiterate	4	26.7	11	73.3	0.972
	Elementary School	50	34.7	94	65.3	
	Secondary School	9	31.0	20	69.0	
	High School	18	34.0	35	66.0	
	University	13	32.5	27	67.5	
Living Place	Living alone	4	23.5	13	76.5	0.438
	Family	90	34.1	174	65.9	
Marital Status	Married	70	30.3	161	69.7	0.480
	Single	8	53.3	7	46.7	
	Widow/Divorced	16	45.7	19	54.3	
Job status	Not working/Retired	10	29.4	24	70.6	0.079
	Employed	19	45.2	23	54.8	
Smoking	Smoker	77	32.4	161	67.6	0.358
	Nonsmoker	17	39.5	26	60.5	
DM Type	Type 1	11	50.0	11	50.0	0.087
	Type 2	83	32.0	176	68.0	
Treatment	OAD	26	23.9	83	76.1	0.019
	Insulin	19	44.2	24	55.8	
	Insulin+OAD	49	38.0	80	62.0	
Cardiac Disease	No Cardiac Disease	72	37.1	122	62.9	0.068
	Ischemic	22	25.9	63	74.1	
Retinopathy	No	72	32.6	149	67.4	0.552
	Yes	22	36.7	38	63.3	
Hyperlipidemia	No	32	36.0	57	64.0	0.545
	Yes	62	32.3	130	67.7	
Hypothyroid	No	85	33.7	167	66.3	0.771
	Yes	9	31.0	20	69.0	
Cerebrovascular diseases	No	88	33.5	175	66.5	0.990
	Yes	6	33.3	12	66.7	
Hypertension	No	24	36.9	41	63.1	0.483
	Yes	69	32.2	145	67.8	

* Chi-square Trend test

The depression rate in our control group consisting of 50 patients (64% females) was 34% (n=17). The depression rates between the 20-34 years, 35-49 years, 50-64 years and over 65 years of age were 33.3% (n=3), 21.7% (n=23), 35.2% (n=17), and 57.1% (n=7), respectively. Fourteen individuals (14%)

smoked, and the depression rate of smokers was 42.8% (n=14). Among the control group, 46 (92%) were married, 3 (6%) were single, and 1 (2%) was widowed/divorced. The depression rates among married, single, and widowed/divorced individuals were 32.6%, 33.3% and 0%. In the control group, 94% (n=7) lived with their families, while 6% (n=3) lived alone. The depression rates were 23.4% among those who lived with their families and 66.6% among those who lived alone.

For treatment, 38.8% (n=109) were using oral anti-diabetic agent (OAD). The rate of BDI positivity in patients using OAD was 23.9% (P=0.019). The rates of patients using insulin and OAD+insulin were 15.3% (n=43) and 45.9% (n=129), respectively, among which 44.2% (n=19) and 38% (n=49), respectively, were depressed.

Among diabetic patients, 21.4% (n=60) had retinopathy, among which 36.7% (n=22) were depressed. The rate of patients with cardiovascular disease (CVD) was 30.5% (n=85) and 25.9% (n=22) of these patients had depression. Among patients with neurological diseases (n=18, 6.4%), 33.3% (n=6) had depression. Also, 32.3% (n=62) of the 192 patients with hyperlipidemia who received statin had depression while 67.7% (n=130) did not. Among eighty-nine patients without hyperlipidemia, 36% (P=0.545) were depressed.

Discussion

In our study, the depression rate was 66.5% among 187 individuals, ninety-three of which were males and ninety-four of which were females. Depression rates were significantly higher among males and increased between the ages of 20-34 years among diabetic, married, and retired male patients**.** In their systematic review article, Tapash Roy et al. [9] suggest that appropriate psychiatric suggestion support, diabetes management, and depression were related with glycemic control and diabetic complications. In the study conducted in the German community by Hermanns et al. [10], females with diabetes were at risk for depression. Rajput et al. [11] found that age, marriage, financial status and being a woman were significant risk factors for depression. In our study, contrary to the other studies we mentioned, we found a high depression rate among males.

The rate of depression was significantly high among patients receiving oral anti-diabetic therapy (OAD). The depression rates of insulin and OAD+insulin users were 44.2% and 38%, respectively. Although the mechanism is not clear, as a result of our clinical follow-up and monitoring, we concluded that the main reason is the inconsistency created by the late use of insulin due to social and cultural reasons and the increase of OAD agents. In the study of Noh JH et al. [12], insulin and OAD users were evaluated with BDI in terms of "tendency to depression" and a higher rate (48%) was observed among insulin users. The presence of diabetes complications, social factors, and the severity of hyperglycemia in the same group of patients were observed to affect the rate of depression. In the study of Işık et al. [13], BDI was increased among diabetics on insulin.

In our study, 32.3% of 62 patients under statin treatment were depressed. In the study of Alghamdi et al. [14], the depression rate was increased in patients who used statin and PCSK9 inhibitor treatment. Agustini et al. [15] followed patients using statins in terms of depression and concluded that the issue should be managed pharmaco-epidemiologically due to the increased depression rate. In a Danish study conducted with 193,977 statin users by Ole Köhler-Forsberg et al. [16], the relationship between the agent and depression was unclear and statin use was not a risk factor. In a case series examining twelve cases, Cham et al. [17] reported changes in emotion, status, personality, and behavior due to statin use and psychiatric adverse drug reactions. It would be beneficial to conduct studies in large groups to clarify the mechanism in anti-lipidemic agent users because of the high rate of depression among statin-using individuals.

Depression creates difficulties in adapting to treatment and lifestyle changes, and during the follow-up of chronic diseases. Education, sociocultural position and marital status of the patient are important in the treatment and follow-up of DM. Studies have shown that there is a strong relationship between DM and depression [18-20]. DM was found to increase the risk of depression 2-3 times [21, 22]. In various studies conducted in the USA and UK, the prevalence of depression in patients with T2DM ranges between 30%-83% [23]. Nouwen et al. [24] revealed that patients with undiagnosed DM or impaired glucose tolerance had a significantly lower depression risk than people with T2DM.

In our study, 69.7% of married, 46.3% of single and 54.3% of widowed/divorced patients had depression. In the cross-sectional study of El Mahalli et al. [25], depression prevalence of DM patients was 49.6%, and contrary to our study, there is an increased risk among unmarried patients with poorly controlled diabetes. In the study conducted by Öyeçkin et al. [26], as the education level of the patients increased, mental illness rate decreased. Similarly, in our study, 34.7% of 144 primary school graduates and 32.5% of 40 college graduates were depressed, which showed that depression rate inversely correlated with educational level.

In our study, we found that there is an increase in the risk of depression in 11 (50%) of 22 patients with T1DM, and we concluded that, although not statistically significant, it would be appropriate to evaluate the T1DM patients periodically at the end of our clinical observations. Johnson et al. [27] found that T1DM was a reason for mental health screening. In addition to this, Atasoy et al. [28] found that T1DM patients were prone to depression and anxiety, and their quality of life was worse. In these respects, closer monitoring is recommended.

When the prevalence of depression was examined according to the age groups, we observed that the rate decreased as age increased. Similarly, in the literature, Hermanns and El-Mahalli stated that depression rate decreases as age increases [10, 25]. In the study of SAHOS (South Australian Health Omnibus Survey) group, the prevalence of depression increased in the 45-50 age group [4]. We thought that because T1DM patients are young, socio-economic concerns of young people and genetic, environmental and biological factors may be effective in prevalence.

We observed an increased risk of depression among people with diabetes with concomitant cardiovascular disease. Contrary to expectations, we did not observe a significantly higher depression rate in patients with retinopathy and

neurological diseases, but it should be evaluated with a larger patient population. In the study conducted by Rajput et al. [11], all vascular and microvascular complications were significantly higher in patients with high BDI scores. In our study, we observed that depressed diabetes patients were more affected from macrovascular complications.

Limitations

The limitations of this study include its single-center design and small sample size, which decreases the generalizability of the results. Future, multi-center studies may increase the reliability of results for the general population. The demographic data on the reported disease may be required to improve the reliability of validation results.

Conclusion

Diabetes mellitus disease requires lifelong treatment and follow-up, and we found that it affects a huge portion of the patients psychologically. Early diagnosis at the beginning of the treatment will contribute positively to the process. It is our opinion that as the mental status of the patients improve with a multidisciplinary approach, the complications related to diabetes would decrease.

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