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The Coronavirus Anxiety Level of Elderly Individuals with Diabetes Mellitus and Associated Factors during the COVID-19 Pandemic

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ABSTRACT

Background Individuals with chronic diseases are less often presented to hospitals due to the restrictions enforced during the pandemic period and the fear of contracting the disease. The purpose of the present study was to investigate the effects of the anxiety level associated with novel coronavirus on daily life, treatment compliance, and metabolic conditions in elderly diabetes mellitus (DM) patients.

Methods This study included 263 patients diagnosed with type 2 DM aged >65 years. The researchers collected the study data through the face-to-face interview method. The Patient Information Form, Coronavirus Anxiety Scale (CAS), Morisky Medication Adherence Scale, Insomnia Severity Index, and the Depression Anxiety Stress Scales (DASS-21) were used for data collection.

Results The mean CAS score was 4.25±3.76. Mean CAS scores were higher in the participants who reported a decrease in the frequency of shopping, grocery/market visits, public transport use, hospital visits, and attending routine checks, during the pandemic ($p<0.05$). Furthermore, a significant positive correlation was found between the mean CAS score and the DASS-21 score ($p<0.05$). There was a significant negative correlation between the mean CAS score and the treatment compliance score ($p<0.05$).

Conclusion The pandemic and coronavirus anxiety have had an adverse effect on daily life, treatment compliance, and metabolic conditions in elderly DM patients.

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INTRODUCTION

First appeared in Wuhan, China, in December 2020, a new disease associated with the SARS-CoV-2 causative factor was defined as coronavirus disease 2019 (COVID-19).[1] The World Health Organization (WHO) defined "COVID-19: Vulnerable and High Risk Groups" in March 2020. Accordingly, older adults and individuals with health conditions, including diabetes mellitus (DM), pulmonary or cardiovascular diseases, and diseases affecting the immune system, were included in that classification.[2]

The Turkish Statistical Institute (TURKSTAT) reported that the Turkish population aged ≥65 years increased by 22.6% in the last five years, reaching 8,451,669 people in 2022.[3] advanced age was also associated with increased mortality.[4,5] Pneumonia, influenza, and healthcare-associated infections (HAIs) are among the top 10 causes of mortality in people aged ≥65 years.[6] Infections are the primary cause of mortality in 1/3 of individuals aged ≥65 years and contribute to mortality in many older adults.[7] Chinese Centre for Disease Control and Prevention reported that the overall mortality rate associated with COVID-19 was 2.3%, compared to 8% and 15% in the 70-79 years and ≥80 years age groups, respectively.5 However, it had a significant contribution to morbidity. COVID-19 is associated with exacerbation in diseases of older adults, causing an increase in the likelihood of secondary risk and functional decline. The restrictions in place to take further measures to protect older adults and the reactions of the older adults in the face of such restrictions also affected the prognoses of chronic diseases.[8]

DM, another global epidemic, is a chronic disease that affects approximately 10.5% of the world's population (536.6 million) in the 20-79 year age group based on the 2021 data. The prevalence of DM is expected to increase to 642.7 million (11.3%) in 2030 and 783.2 million (12.2%) in 2045. The Turkish data is indicative of the fact that the prevalence of DM in adults has reached an alarming level of 15.9% in 2021.[9] The coexistence of two pandemics (dual pandemic) results in a large number of patients affected by both pandemics and is associated with poor prognosis in such patients.[10] Furthermore, studies have reported that based on the preliminary data, the prevalence of COVID-19 infection and severe pneumonia was higher in DM patients than in individuals without DM; therefore, the associated mortality rates were also higher.[11,12]

It was suggested that DM patients should be followed up at home during the COVID-19 pandemic, and results of blood glucose measurements should be communicated to healthcare professionals to allow drug and insulin dose adjustments. Nevertheless, it was also suggested that DM management was not only limited to blood glucose monitoring but also included an ongoing monitoring of comorbidities and complications.[13] Notwithstanding above, it is evident that there have been particular problems for patients and healthcare professionals, who have to deal with this contingent situation. It was suggested that one of the most critical problems was the decreased metabolic control of the DM patients, who were not willing to leave their homes and present to the hospital out of fear of infection. Older adults and DM patients are at serious risk of mortality and morbidity during the COVID-19 pandemic. The extensive COVID-19 coverage both in the press and visual media, as well as the prolonged curfews, can lead DM patients to experience problems both in terms of the pandemic and the prognosis of DM. The present study was planned to investigate the effect of the anxiety level associated with the new coronavirus on daily life, treatment compliance, and metabolic conditions of elderly DM patients.

MATERIAL AND METHODS

The population of the present study comprised patients diagnosed with type 2 DM and followed up at the Endocrine and Metabolic Diseases Outpatient Clinics of Isparta City Hospital. The sample consisted of patients aged >65 years (n: 263) diagnosed with type 2 DM who attended the control visits during the study term and volunteered to participate. According to the study's inclusion criteria, patients aged >65 years with type 2 DM who agreed to participate in the research and could communicate in Turkish were included in the study. Patients who did not meet these criteria and could not complete the entire questionnaire were excluded from the study.

Ethical aspect

The required permission for the study's conduct was obtained from the Isparta Clinical Research Ethics Committee. Informed voluntary consent of the patients who participated in the study was obtained before the onset of the study.

Data collection

The study data was collected by the researchers

using the face-to-face interview method. The questionnaire form developed by the researchers based on a literature review was used for data collection. The questionnaire consisted of 5 sections, including patient sociodemographic data, COVID-19 information and interventions, Coronavirus Anxiety Scale (CAS), Morisky Medication Adherence Scale (MMAS), Insomnia Severity Index (ISI), and Depression Anxiety Stress Scale.

Sociodemographic data included inquiries regarding age, sex, educational status, marital status, duration of disease, and treatments. In addition, the patient's preprandial blood glucose (PPBG) and haemoglobin A1c (HbA1c) before the pandemic and during the data collection phase were retrieved from their electronic files and recorded in the sociodemographic data section.

COVID-19 information and interventions

This section included inquiries about information on COVID-19 history, whether COVID-19-related news was followed, vaccination considerations, behavioural patterns during the pandemic period (going out, paying visits, having guests, eating out, and going on a holiday) and habits (hand washing, shopping at grocery store and malls, and use of public transport), presentation to hospital, and attending regular control visits.

The Coronavirus Anxiety Scale (CAS), developed by Lee[14], was defined as "a short mental health screener of dysfunctional anxiety cases associated with the COVID-19 crisis." The five-point Likert-type scale consists of 5 items and one domain. Biçer *et al*.[15] conducted a language validity and reliability study for Turkey. The Cronbach's alpha coefficient of the scale was 0.832 in the above research. In the present study, Cronbach's alpha was 0.863.

Morisky Medication Adherence Scale (MMAS) was developed by Morisky and validated by Morisky, Green, and Levine in 1986.[16] It was a self-report and easy-to-use scale that measured the patient's treatment compliance. The scale comprises six closed-ended items with two options (yes/no). There were several validity and reliability studies of the scale for use in Turkey[17,18], and Cronbach's alpha coefficient was 0.782 in DM patients.[19] In the present study, the Cronbach's alpha coefficient was 0.551.

Insomnia Severity Index (ISI), developed by Morin[20], was a measurement tool for assessing insomnia severity with high validity and reliability. The scale consisted of seven items scored between 0–4 points. The overall score on the scale ranged from 0 to 28. Higher scores suggested a higher severity of insomnia. The validity and reliability study of the scale for Turkey was conducted by Boysan *et al*.[21], with a Cronbach's alpha coefficient of 0.79. In the present study, Cronbach's alpha coefficient was 0.833.

Depression Anxiety and Stress Scales (DASS-21), developed by Lovibond and Lovibond[22,23], the unabridged DASS scale consists of 42 items. Subsequent studies demonstrated that a 21-item shorter form of DASS-21 was also valid to perform the same measurement.[24,25] DASS-21 consisted of 7 items each to measure the depression, stress, and anxiety subdomains. The overall score varied between 0–63, while the subdomain scores ranged from 0 to 21. An individual with a subdomain score of ≥5 points from the depression subdomain, ≥4 points from anxiety, and ≥8 points from stress was considered to have the pertinent problem. Sarıçam[26] reported in the validity and reliability study of the scale for Turkey that the Cronbach's alpha coefficients for the subdomains were 0.85, 0.80, and 0.77 in the depression, anxiety, and 0.77 stress subdomains, respectively. In the present study, the Cronbach's alpha coefficients for the subdomain were 0.552, 0.652, and 0.890 in the anxiety, depression, and stress subdomains, respectively, with a Cronbach's alpha coefficient of 0.819 for the overall scale.

Statistical analysis

The study data were electronically analysed using the IBM Statistical Package for the Social Sciences v22 (SPSS Inc., Chicago, IL, USA) software. The normal distribution hypothesis was investigated by the Shapiro–Wilk test. The percentage, one-way ANOVA or chi-squared, Mann–Whitney U or Student t-test, and Pearson correlation analysis were used to assess data on SPSS.

RESULTS

The effect of coronavirus anxiety on daily life

Most older DM patients reported not going out more than once a week, visiting relatives, receiving guests, eating out/drinking out, and going on vacation since the start of COVID-19. In addition, there was an increase in the frequency of hand washing and a decrease in the frequency of shopping at grocery

Table 1. Distribution of mean MMAS, CAS, ISI, and DASS-21 scores by sociodemographic data of diabetes mellitus patients

Sociodemographic data		n (%)	MMAS	CAS	ISI	DASS-21	DASS-21 Anxiety	DASS-21 Depression	DASS-21 Stress
Gender	Female	150 (57.03)	2.34±1.54	4.25±3.87	8.99±3.66	40.07±14.21	14.13±4.70	13.05±7.82	12.89±4.79
	Male	113 (42.97)	2.55±1.23	4.24±3.64	8.96±4.21	37.92±14.05	13.96±5.44	11.80±7.20	12.16±4.56
	t		1.680	0.012	0.045	1.226	0.267	1.340	1.264
	P value		0.94	0.991	0.964	0.221	0.790	0.181	0.208
Marital status	Married	225 (85.6)	2.44±1.15	4.26±3.73	9.08±3.82	39.11±13.83	14.12±5.11	12.41±7.17	12.57±4.68
	Single	38 (14.4)	2.39±1.02	4.15±4.01	8.34±4.03	39.39±15.97	13.66±4.45	13.13±9.71	12.61±4.85
	Mann-Whitney U		4223.000	4107.000	3965.500	4153.000	4194.500	4256.500	4168.500
	P value		0.900	0.694	0.466	0.777	0.851	0.965	0.803
People living together	Alone	24 (9.10)	2.58±1.10	3.96±3.85	8.58±3.79	38.88±11.91	13.54±4.23	12.33±5.12	13.00±4.46
	Spouse	126 (47.90)	2.48±1.15	4.75±4.12	8.98±3.92	40.21±14.19	14.77±5.73	12.71±7.01	12.73±4.91
	Spouse and children	56 (21.30)	2.23±1.04	3.64±3.26	9.23±3.94	37.01±15.12	13.21±4.66	12.14±8.77	11.66±4.20
	Children	57 (21.70)	2.43±1.19	3.88±3.30	8.89±3.94	39.02±13.97	13.51±3.69	12.54±8.49	12.96±4.78
	χ^2		3.654	3.221	0.564	3.121	3.168	2.203	2.186
	P value		0.301	0.359	0.905	0.373	0.366	0.531	0.535
Education status	Literate	15 (5.70)	1.93±0.79	5.33±3.52	9.07±4.86	40.53±11.04	15.53±5.45	12.13±3.91	12.87±4.61
	Primary school	143 (54.04)	2.48±1.12	4.31±3.88	8.94±3.55	40.77±14.58	14.14±4.60	13.31±8.15	13.31±4.94
	High school	84 (31.90)	2.54±1.14	4.24±3.78	9.18±4.15	37.36±13.98	13.82±5.26	11.78±7.55	11.75±4.29
	University	21 (8.00)	2.05±1.13	3.09±2.95	8.38±4.58	34.28±12.29	13.33±6.47	10.28±4.42	10.66±3.69
	χ^2		8.476	3.904	0.703	5.894	3.200	5.164	8.115
	P value		0.037	0.272	0.872	0.117	0.362	0.160	0.044
Occupation	Working	47 (17.90)	2.57±1.07	3.77±3.87	8.72±4.09	36.45±13.62	13.68±5.79	11.34±5.27	11.43±4.67
	Housewife	89 (33.80)	2.38±1.15	4.16±3.77	9.54±3.52	41.76±14.18	14.67±4.92	13.59±7.77	13.49±4.8
	Retired	107 (40.70)	2.42±1.10	4.64±3.55	8.74±3.98	37.34±12.47	13.49±4.36	11.71±6.74	12.14±4.21
	Other	20 (7.60)	2.35±1.38	3.70±4.67	8.35±4.51	43.50±20.47	15.15±6.56	14.80±13.15	13.55±6.02
	χ^2		1.368	5.072	5.358	7.260	3.580	5.483	7.556
	P value		0.713	0.167	0.147	0.064	0.310	0.140	0.056
DM in their family	Yes	124 (47.10)	2.47±1.17	4.33±3.68	8.66±3.82	37.87±14.46	13.61±4.66	12.19±8.16	12.07±4.64
	No	139 (52.90)	2.40±1.10	4.17±3.85	9.26±3.96	40.28±13.79	14.44±5.31	12.81±7.03	13.03±4.72
	t		0.520	-0.357	1.245	1.383	1.355	0.64	1.653
	P value		0.604	0.721	0.214	0.168	0.177	0.507	0.100
Drugs used	OAD	111 (42.20)	2.43±1.05	4.50±3.87	8.75±3.86	38.06±13.22	13.84±4.86	12.10±6.90	12.13±4.55
	Insulin	87 (33.10)	2.37±1.13	4.45±3.56	8.84±3.81	38.12±11.27	14.03±4.71	11.62±4.67	12.52±4.54
	Switching from OAD to insulin	14 (5.30)	2.79±1.67	4.43±3.27	10.78±3.77	43.71±14.59	15.64±5.85	14.21±6.89	13.86±4.47
	OAD and insulin	51 (19.40)	2.43±1.17	3.31±3.96	9.22±4.12	41.92±19.25	14.12±5.68	14.49±11.80	13.31±5.31
	χ^2		0.649	6.176	6.228	1.836	1.952	2.111	3.542
	P value		0.885	0.103	0.101	0.607	0.582	0.550	0.315
Trained in DM	Yes	239 (90.90)	2.44±1.16	4.23±3.76	8.88±3.99	39.11±13.82	14.04±4.92	12.45±7.10	12.62±4.77
	No	24 (9.10)	2.33±0.81	4.46±3.95	9.96±2.69	39.54±17.32	14.21±6.09	13.21±11.47	12.13±4.07
	Mann-Whitney U		2804.500	2752.000	2624.500	2854.500	2791.000	2860.000	2742.500
	P value		0.852	0.740	0.484	0.970	0.827	0.982	0.720

CAS: Coronavirus Anxiety Scale, DASS: Depression Anxiety Stress Scale, DM: Diabetes Mellitus, ISI: Insomnia Severity Index, MMAS: Morisky Medication Adherence Scale, OAD: Oral Antidiabetic Drug.

Table 2. Distribution of mean MMAS, CAS, ISI, and DASS-21 scores by COVID-19 data of diabetes mellitus patients

COVID-19 data		n (%)	MMAS	CAS	ISI	DASS-21	DASS-21 Anxiety	DASS-21 Depression	DASS-21 Stress
Source of information about COVID-19	TV	78 (29.70)	2.86±1.09	5.36±4.85	9.04±4.36	35.99±11.52	13.51±4.91	10.37±3.65	12.10±5.94
	Internet	22 (8.40)	2.73±1.35	4.23±3.22	11.91±3.38	36.50±12.00	14.36±9.30	9.00±4.26	13.14±2.85
	Health workers	10 (3.80)	3.50±1.35	4.10±4.20	8.10±4.33	38.70±14.76	13.00±4.11	12.80±5.94	12.90±6.03
	Social media	21 (8.00)	2.67±0.96	4.47±3.03	6.66±2.37	25.57±7.34	9.19±2.96	7.62±1.69	8.76±3.86
	All	132 (50.20)	2.01±0.96	3.58±3.02	8.89±3.58	43.65±14.77	15.17±3.82	15.13±9.25	13.35±3.77
	$\chi 2$		3.548	0.591	16.467	22.956	17.154	20.087	14.270
	P value		0.315	0.899	0.001	<0.001	0.001	<0.001	0.003
Frequency of following news about COVID-19	More than once a day	142 (54.00)	2.48±1.10	5.09±3.25	8.91±4.16	38.08±11.80	14.23±5.31	11.97±4.65	11.87±4.33
	Once a day	121 (46.00)	2.37±1.17	3.26±4.09	9.06±3.58	40.41±16.42	13.84±4.67	13.16±9.96	13.41±4.99
	t		–0.521	4.030	–0.313	–1.299	0.632	–1.266	–2.664
	P value		0.602	<0.001	0.755	0.195	0.528	0.277	0.008
Considering COVID-19 vaccination	Yes	159 (60.50)	2.50±1.21	3.59±4.13	8.94±4.19	38.87±15.64	13.42±5.42	12.22±9.04	13.22±5.31
	No	104 (39.50)	2.32±1.00	5.25±2.88	9.02±3.41	39.56±11.51	15.01±4.19	12.96±4.51	11.58±3.36
	t		–1.466	–3.552	–0.174	–0.413	–2.687	–0.769	2.801
	P value		0.144	<0.001	0.862	0.680	0.008	0.443	0.005
COVID-19 history	Yes	90 (34.20)	2.26±1.00	3.70±3.03	8.83±4.20	32.05±9.38	12.19±4.66	9.24±3.31	10.62±4.55
	No	173 (65.80)	2.52±1.19	4.54±4.08	9.05±3.74	42.84±14.79	15.02±4.94	14.22±8.56	13.59±4.46
	Mann-Whitney U		7072.500	7237.500	7537.500	4019.500	5083.000	4222.000	5077.000
	P value		0.203	0.342	0.666	<0.001	<0.001	<0.001	<0.001
Having a relative with COVID-19	Yes	100 (38.00)	2.19±1.05	3.29±3.07	7.97±4.38	31.24±9.78	11.34±4.57	8.87±3.59	11.03±4.78
	No	163 (62.00)	2.58±1.17	4.83±4.04	9.58±3.45	43.99±14.27	15.70±4.56	14.76±8.49	13.53±4.42
	t		2.470	–3.262	–3.319	–8.572	–7.511	–6.578	–4.313
	P value		0.014	0.001	0.001	<0.001	<0.001	<0.001	<0.001

Coronavirus Anxiety Scale, DASS: Depression Anxiety Stress Scale, ISI: Insomnia Severity Index, MMAS: Morisky Medication Adherence Scale.

stores and shopping malls and using public transport. Most patients with DM also reported a reduction in the frequency of hospital presentations and attending regular control visits.

The mean score from the CAS was 4.25±3.76. The mean CAS scores were higher in the participants without a relative with a history of COVID-19 (p=0.001). The mean CAS scores were higher in the participants, who reported a decrease in the frequency of shopping, grocery/market visits, public transport use, presentation to hospital, and attending to routine controls during the pandemic (p<0.05). (*Table 1, 2, 3 and 4).*

The mean score from the ISI scale was 8.97±3.89. The mean scores from the DASS-21 scale were as follows: total scale (39.14±14.13), anxiety subdomain (14.05±5.02), depression subdomain (12.51±7.52), and stress subdomain (12.57±4.70). Furthermore, there was a significant positive correlation between the mean CAS score, the total score, and all the subdomain scores of the DASS-21 (p<0.05). *(Table 5)*

The effect of coronavirus anxiety on treatment compliance

The mean score for treatment compliance was 2.16±0.96. The treatment compliance scores were lower in the literate participants and those with relatives who contracted COVID-19 (p<0.05). There was a significant negative correlation between the mean CAS score and the treatment compliance score (p<0.05). In addition, the treatment compliance score decreased as DASS-21 scores increased (p<0.05).

The effect of coronavirus anxiety on metabolic condition

The PPBG values at data collection and during the previous year were 191.16±50.92 mg/dL and 146.46±30.34 mg/dL, respectively, and the difference was statistically significant (r=0.632, p<0.001). The difference between HbA1c values at the time of data collection and compared to the previous year in elderly DM patients was statistically significant (r=0.408, p<0.001). There was a significant relation between the mean CAS score and PPBG and HbA1c values (p<0.05).

DISCUSSION

During the pandemic, many elderly DM patients refrained from hospital visits due to both COVID-19-related anxiety and restrictions, potentially impacting their daily routines, treatment adherence, and metabolic health. This study aimed to assess the effects of novel coronavirus-related anxiety on daily life, treatment adherence and metabolic conditions in elderly DM patients.

The effect of coronavirus anxiety on daily life

As a result of the quarantine measures and restrictions, the elderly worldwide have been unable to leave their houses since the onset of the COVID-19 pandemic.[27] These restrictions and prohibitions led to increased social isolation for the individuals who enjoyed social contact only outside their homes (shopping, going to places of worship, or visiting family and friends, among other reasons).[28] In this study, most elderly DM patients have not visited their relatives, received guests, or eaten and drank out since the onset of the COVID-19 pandemic. Additionally, there has been a decrease in the frequency of going to a market, shopping, and using public transportation. This change in the behaviours of individuals may be attributed to the fear of contracting the disease and increased social isolation due to social restrictions.

Social and political messages released by governments affect how older adults feel about the risks of contracting the virus and the risks others pose to their health.[27] The social isolation of older adults is highly important due to its detrimental effect on their mental health.[29] In the present study, coronavirus anxiety was higher in the older adults, who went shopping, used public transport, presented to hospital, and attended routine controls less frequently during the pandemic period (p<0.05). Similarly, Santini *et al*.[29] reported in their study of 3,005 older adult individuals that social restrictions increased perceived social isolation and that higher perceived social isolation was associated with anxiety symptoms. A study by Kuan-Yu *et al*.[30] found that individuals with no chronic mental health disorders before the pandemic had increased anxiety and depression symptoms during the pandemic. The results of the present study are consistent with that of the literature. Increased social isolation may lead to coronavirus anxiety, and further, individuals with high coronavirus anxiety may isolate themselves from society out of fear of contracting the disease.

In the present study, coronavirus anxiety was higher in older adults who did not have a relative with a history of COVID-19. Similarly, a study by Montano and Acebes31 reported that participants with a

Table 3. Distribution of mean MMAS, CAS, ISI, and DASS-21 scores by the behaviors of diabetes mellitus patients

Behaviors from the beginning of COVID-19		n (%)	MMAS	CAS	ISI	DASS-21 Total score	DASS-21 Anxiety	DASS-21 Depression	DASS-21 Stress
Frequency of going out	Multiple times a day	45 (17.10)	2.60±1.03	2.53±3.15	9.37±4.72	43.80±22.12	15.44±7.33	15.64±14.93	12.71±4.88
	Once every day	66 (25.10)	1.91±1.22	2.68±2.64	7.44±4.48	34.71±11.14	11.98±3.64	10.14±4.58	12.59±4.59
	Every 2-3 days	32 (12.20)	2.56±1.34	4.50±3.55	10.00±4.74	34.81±13.86	13.94±6.56	10.53±5.13	10.34±4.51
	Once a week	26 (9.90)	3.19±0.89	4.15±3.07	9.50±4.22	36.65±13.78	13.50±4.93	11.42±5.36	11.73±4.96
	Less than once a week	94 (35.70)	2.46±0.94	6.11±4.12	9.37±1.90	42.20±9.35	15.03±3.23	13.67±3.61	13.50±4.47
	F		7.397	13.006	3.748	5.211	4.914	5.075	3.021
	P value		<0.001	<0.001	0.006	<0.001	0.001	0.001	0.018
Frequency of visiting relations	Yes	3 (1.10)	3.00±0.00	6.00±0.00	13.00±0.00	30.00±0.00	8.00±0.00	7.00±0.00	15.00±0.00
	No	176 (66.90)	2.34±1.18	4.84±3.88	8.98±3.81	38.89±9.85	14.35±4.50	11.56±3.89	12.98±4.35
	Sometimes	63 (24.00)	2.75±1.03	2.88±3.65	10.46±2.62	45.51±20.65	15.51±5.58	17.06±12.82	12.94±5.48
	Rarely	21 (8.00)	2.19±0.92	3.09±1.61	3.86±3.72	23.48±6.96	8.00±2.30	7.67±2.61	7.81±2.16
	$\chi2$		13.285	18.202	41.152	44.560	50.621	39.215	26.223
	P value		0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Frequency of receiving guests	Yes	11 (4.20)	3.45±0.93	6.09±1.70	9.09±2.81	31.82±9.89	9.18±4.14	8.63±5.10	14.00±2.36
	No	148 (56.30)	2.07±0.98	4.69±3.63	8.91±3.93	39.13±9.15	14.81±4.49	11.66±3.66	12.65±3.87
	Sometimes	69 (26.20)	2.74±0.88	3.26±4.29	9.76±3.08	42.04±20.84	14.15±5.55	15.44±12.64	12.43±5.99
	Rarely	31 (11.80)	2.94±1.59	3.22±2.95	7.38±5.33	35.00±16.02	11.93±5.24	11.64±5.79	11.42±5.50
	Often	4 (1.50)	3.50±1.73	7.75±2.87	10.00±1.41	42.25±4.34	14.00±4.24	11.00±2.71	17.25±2.50
	$\chi2$		41.471	22.417	3.285	7.467	21.604	12.590	9.413
	P value		<0.001	<0.001	0.511	0.113	<0.001	0.013	0.052
Frequency of going out to a café/restaurant	Yes	3 (1.10)	4.00±0.00	10.00±0.00	11.00±0.00	44.00±0.00	18.00±0.00	13.00±0.00	13.00±0.00
	No	186 (70.70)	239±1.07	5.05±3.89	9.02±3.96	37.61±11.22	14.04±5.09	11.52±4.28	12.05±4.61
	Sometimes	14 (5.30)	3.50±1.50	3.07±3.49	9.64±3.47	37.64±17.23	13.85±6.49	12.50±6.59	11.28±5.57
	Rarely	60 (22.80)	2.23±1.09	1.75±1.59	8.58±3.87	44.01±19.83	13.93±4.52	15.60±13.22	14.48±4.44
	$\chi2$		14.671	43.038	6.211	1.750	5.314	2.218	20.264
	P value		0.002	<0.001	0.102	0.626	0.150	0.528	<0.001
Going on a holiday	Yes	37 (14.10)	1.78±1.29	2.29±2.43	10.97±1.38	38.73±8.28	12.70±2.32	10.81±3.88	15.21±3.23
	No	226 (85.90)	2.54±1.07	4.57±3.86	8.65±4.08	39.21±14.89	14.27±5.31	12.79±7.99	12.14±4.77
	Mann-Whitney U		2282.500	2830.000	1980.000	4173.500	3430.500	4114.000	2154.500
	P value		<0.001	0.001	<0.001	0.986	0.077	0.874	<0.001

CAS: Coronavirus Anxiety Scale, DASS: Depression Anxiety Stress Scale, ISI: Insomnia Severity Index, MMAS: Morisky Medication Adherence Scale.

Table 4. Distribution of mean MMAS, CAS, ISI, and DASS-21 scores by the habits of diabetes mellitus patients

Habits since the onset of COVID-19		n (%)	MMAS	CAS	ISI	DASS-21	DASS-21 Anxiety	DASS-21 Depression	DASS-21 Stress
Frequency of shopping	Increase	50 (19.00)	2.40±1.61	3.34±3.11	10.02±3.21	38.38±7.55	12.86±3.32	10.72±3.52	14.80±2.85
	Unchanged	36 (13.70)	3.08±1.46	4.92±3.38	8.97±4.56	39.06±12.05	14.17±5.01	11.75±5.31	13.14±5.44
	Decrease	177 (67.30)	2.31±0.81	4.37±3.98	8.68±3.89	39.38±15.89	14.37±5.38	13.18±8.65	11.84±4.77
	$\chi2$		8.589	44.836	3.168	10.571	7.698	16.608	1.817
	P value		0.014	<0.001	0.205	0.005	0.021	<0.001	0.403
Frequency of hand washing	Increase	153 (58.20)	2.48±1.29	2.92±3.16	8.90±4.00	38.14±16.26	13.35±5.45	12.16±9.33	12.62±4.77
	Unchanged	91 (34.60)	2.22±0.78	6.05±4.03	9.00±3.60	41.13±10.04	15.19±3.99	13.20±3.78	12.72±4.69
	Decrease	19 (7.20)	3.05±1.03	6.36±2.24	9.47±4.52	37.73±11.72	14.21±5.11	12.05±4.90	11.47±4.19
	$\chi2$		8.589	44.836	3.168	10.571	7.698	16.608	1.817
	P value		0.014	<0.001	0.205	0.005	0.021	<0.001	0.403
Frequency of going to a market	Increase	78 (29.70)	2.49±1.31	2.71±2.81	9.45±3.23	45.05±17.09	14.45±4.20	15.50±11.72	15.10±3.67
	Unchanged	41 (15.60)	2.66±1.59	4.07±4.01	6.21±5.60	34.12±12.25	12.56±5.58	10.04±4.61	11.51±4.89
	Decrease	144 (54.80)	2.33±0.85	5.14±3.89	9.51±3.29	37.38±11.71	14.26±5.21	11.60±4.22	11.51±4.64
	F		1.156	11.442	13.307	11.350	2.198	9.901	18.067
	P value		0.316	<0.001	<0.001	<0.001	0.113	<0.001	<0.001
Frequency of using public transport	Unchanged	51 (19.40)	3.08±1.46	5.64±4.41	9.43±5.11	38.92±12.72	14.63±5.24	11.96±5.05	12.33±5.07
	Decrease	212 (80.60)	2.27±0.98	3.91±3.52	8.86±3.54	39.20±14.47	13.92±4.96	12.65±8.06	12.63±4.62
	Mann-Whitney U		4011.000	4489.500	4726.000	5199.500	4893.000	5375.500	5197.500
	P value		0.003	0.056	0.155	0.670	0.288	0.949	0.665
Frequency of hospital presentations	Unchanged	59 (22.40)	3.32±1.11	4.00±4.09	11.19±3.88	48.17±17.90	15.78±4.78	17.41±11.19	14.98±4.68
	Decrease	146 (55.50)	2.09±0.96	4.06±3.61	8.33±3.54	35.75±10.77	13.03±4.56	10.87±4.03	11.85±4.41
	None at all	58 (22.10)	2.31±1.06	5.05±3.61	8.12±3.90	38.54±13.49	14.88±5.77	11.69±7.89	11.97±4.67
	F		33.000	3.454	9.509	18.474	7.689	18.206	10.702
	P value		<0.001	0.033	<0.001	<0.001	0.001	<0.001	<0.001
Frequency of attending to regular controls	Increase	8 (3.00)	3.42±1.31	6.91±4.75	13.16±3.99	47.13±9.67	17.37±4.68	15.12±4.48	14.63±5.31
	Unchanged	53 (20.20)	2.90±1.09	2.46±3.34	11.74±3.77	49.28±19.80	15.69±4.55	18.43±13.34	15.15±4.43
	Decrease	142 (54.00)	2.21±1.04	4.40±3.60	8.22±3.22	36.48±10.94	13.34±4.59	11.21±4.09	11.93±4.35
	None at all	60 (22.80)	2.44±1.18	5.07±3.82	7.28±4.09	35.43±10.57	13.83±5.95	10.03±3.54	11.56±4.84
	$\chi2$		46.511	11.646	33.598	25.415	20.055	29.995	27.934
	P value		<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001

CAS: Coronavirus Anxiety Scale, DASS: Depression Anxiety Stress Scale, ISI: Insomnia Severity Index, MMAS: Morisky Medication Adherence Scale.

Table 5. Correlation of certain characteristics of diabetes mellitus patients with mean MMAS, CAS, ISI, and DASS-21 scores

Characteristics of patients	CAS		MMAS		ISI		DASS-21	
	r	P value	r	P value	r	P value	r	P value
Age	0.055	0.376	–0.041	0.512	0.019	0.764	0.096	0.120
DM duration	0.113	0.067	0.048	0.439	–0.071	0.252	–0.024	0.696
PPBG	0.024	0.705	–0.021	0.737	0.037	0.564	–0.025	0.696
HbA1c	–0.071	0.263	–0.025	0.693	–0.025	0.697	–0.047	0.461
MMAS	–0.302	<0.001	-	-	–0.051	0.412	–0.308	<0.001
ISI	0.022	0.720	–0.051	0.412	-	-	0.399	<0.001
DASS-21	0.229	<0.001	–0.308	<0.001	0.399	<0.001	-	-
Depression	0.044	0.472	–0.125	0.043	0.247	<0.001	0.893	<0.001
Anxiety	0.266	<0.001	–0.288	<0.001	0.486	<0.001	0.749	<0.001
Stress	0.333	<0.001	–0.330	<0.001	0.281	<0.001	0.768	<0.001

CAS: coronavirus anxiety scale, DASS: depression anxiety stress scale, DM: diabetes mellitus, HbA1c: hemoglobin A1c, ISI: insomnia severity index, MMAS: Morisky medication adherence scale, PPBG: preprandial blood glucose.

COVID-19-positive family member had lower levels of anxiety. In contrast, certain studies reported that having a COVID-19-positive family member was associated with increased anxiety.[32,33] Different prognoses of COVID-19 in the participants' relatives might account for the different results in the studies above. The fact that having a relative with COVID-19 was associated with lower anxiety in the present study, may be due to a decrease in uncertainty about the disease and accordingly, an easier adaptation to the anxiety factor regarding contracting the disease.

In the present study, coronavirus anxiety increased as anxiety, stress, and depression increased. Similarly, relevant studies suggested that during the pandemic, the anxiety, stress, and depression levels significantly increased in the individuals[34]; and that the foregoing were positively correlated to each other.[35-37] Consistent with the previous studies with adult groups during the pandemic period, the anxiety, stress, and depression levels of DM patients during the pandemic were positively correlated with sleep problems.[38-40] Ahmed *et al*.[41] suggested in a cross-sectional study to assess the long-term impact of the COVID-19 pandemic that DM was a risk factor for mental health and sleep problems. A previous study reported that 87% of patients with type 2 DM were affected due to psychological stress during the quarantine period, where 27% experienced sleep deprivation.[42]

The effect of coronavirus anxiety on treatment compliance

Treatment compliance is essential for individuals with conditions including advanced age, DM, and exposure to COVID-19, which need to be controlled concurrently.[43] Uncontrolled blood glucose levels can significantly increase mortality as well as the incidence of complications. Therefore, patients must adhere to medical treatment and maintain a healthy lifestyle.[44] More than a third of older adults may fail to adhere to their treatment.[43] A study by Alshareef *et al*.[44] suggested that the treatment compliance levels of DM patients significantly decreased due to the COVID-19 pandemic. Another study with patients with type 2 DM reported lower treatment compliance levels in patients with anxiety and depression.[45] Similarly, the fact that lower treatment compliance levels in DM patients were associated with higher coronavirus anxiety, anxiety, stress, and depression levels in the present study was consistent with the relevant literature.

The effect of coronavirus anxiety on metabolic condition

DM patients are considered a high-risk population prone to a complex prognosis of COVID-19 and associated deaths. It was suggested that inevitable changes in daily life and behaviours due to the pandemic could affect DM's self-management and glycemic control.[46] Furthermore, ageing alone can make it challenging to manage DM, notwithstanding other factors.[47] A study by Falcetta *et al*.[48] reported that the age variable in the COVID-19 pandemic was one of the most significant risk factors for impaired glycemic control in DM patients. Consistently, the present study found that the PPBG and HbA1c values of DM patients were higher compared to that of the previous year ($p<0.05$). The deteriorating metabolic control during the pandemic may be associated with certain adverse situations, including degraded family economic status, limited access to healthy food due to restrictions, impaired diet,

inaccessibility of healthcare services due to restricted outpatient clinic services at the hospitals and fear of contracting the disease, decreased physical activity, restricted social activities, and increased stress.[49]

A study by Ruissen *et al*.[46] reported that the COVID-19 pandemic and quarantine measures increased anxiety in DM patients, resulting in weight gain and less physical exercise. Nevertheless, notwithstanding the above factors, there was no deterioration in glycemic control. Accordingly, there was no significant relationship between coronavirus anxiety and metabolic condition in the present study. However, it was observed that the pandemic had an overall adverse effect on the metabolic control of DM patients.

CONCLUSIONS

In conclusion, the present study demonstrated that the pandemic and coronavirus anxiety had an adverse effect on the daily life, treatment compliance, and metabolic control of elderly DM patients. The negative impact of the pandemics on the physiological and psychological well-being of individuals is still ongoing, albeit decremental, despite a certain period that has passed since its beginning. This long-term condition can further affect individuals with chronic diseases, especially DM, which needs to be well-controlled. Therefore, healthcare professionals should consider the need for regular check-ups of DM patients. Furthermore, healthcare professionals must exercise due care for the needs and emotions of the DM individuals and develop new ways to maintain patient control and training under extraordinary circumstances when face-to-face patient examination cannot be conducted. In the context thereof, ensuring continuous clinical support via phone or online calls, channelling patients to sources that provide original, up-to-date, and accurate health information, and using specific strategies such as telemonitoring are recommended. Accordingly, these steps may contribute to controlling anxiety and stress, improving daily life, increasing treatment compliance, and maintaining metabolic control in DM patients.

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Conflict of Interests

The authors declare no conflict of interest.

Ethical Approval

The protocol of the study was approved by the Medical Ethics Committee of Süleyman Demirel University, Scholl os Medicine, Isparta, Turkey. (Decision number: 158, date: 24.05.2022).

Authors' Contribution

Study Conception: SE, SP, ADA, MA, İHE; Study Design: SE, SP, DAD, MA, İHE; Literature Review: DAD, SE; Critical Review: SE, SP, DAD, MA, İHE; Data Collection and/or Processing: SE, MA, İHE,; Analysis and/or Data Interpretation: SE, SP; Manuscript preparing: DAD, SE, SP.

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