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The Relationship Between Diabetes Knowledge Level, Physical Activity, and Quality of Life in Older Adults

Yaşlılarda Diyabet Bilgi Düzeyi, Fiziksel Aktivite ve Yaşam Kalitesi Arasındaki İlişki

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ABSTRACT

Aim*: This study aimed to examine the relationship between knowledge about diabetes, physical activity, and quality of life in older adults with type 2 diabetes.*

Material and Method: *A total of 188 geriatric individuals with a mean age of 75.2 years were included in this study. The level of knowledge about diabetes was assessed by the Diabetes Information Questionnaire-24, the Kasari index was used to assess the level of physical activity, and quality of life was assessed by the Diabetes-39 Quality of Life Questionnaire.*

Results: *The participants' knowledge about diabetes, their physical activity levels according to the Kasari index, and Diabetes-39 quality of life scores were all low. It was determined that level of knowledge was significantly related to physical activity and the Diabetes-39 diabetes control subgroup score ($p<0.005$). There was a significant relationship between the Kasari index and Diabetes-39 quality of life total score ($p<0.005$).*

Conclusion: *Level of knowledge about diabetes is related to physical activity and quality of life in elderly adults. It is important to encourage participation in training programs and increase physical activity to improve the quality of life of these individuals, who must live with this chronic disease for many years while also accompanied by geriatric symptoms.*

Keywords: *Diabetes Mellitus, Geriatrics, Knowledge, Physical activity, Quality of life*

ÖZET

Amaç: *Bu çalışmada tip 2 diyabetli yaşlılarda diyabet bilgisi, fiziksel aktivite ve yaşam kalitesi arasındaki ilişkinin incelenmesi amaçlanmıştır.*

Gereç ve Yöntem: *Bu çalışmaya yaş ortalaması 75.2 yıl olan toplam 188 geriatrik birey dahil edilmiştir. Diyabet hakkındaki bilgi düzeyi Diyabet Bilgi Anketi-24 ile, fiziksel aktivite düzeyini değerlendirmek için Kasari indeksi kullanıldı ve yaşam kalitesi Diyabet-39 Yaşam Kalitesi Anketi ile değerlendirildi.*

Bulgular: *Katılımcıların diyabet hakkındaki bilgi düzeyleri, Kasari indeksine göre fiziksel aktivite düzeyleri ve Diyabet-39 yaşam kalitesi skorlarının tümü düşüktü. Bilgi düzeyinin fiziksel aktivite ve Diabetes-39 diyabet kontrol alt grup skoru ile anlamlı düzeyde ilişkili bulunmuştur ($p<0.005$). Kasari indeksi ile Diabetes-39 yaşam kalitesi toplam puanı arasında anlamlı bir ilişki vardı ($p<0.005$).*

Sonuç: *Diyabet hakkındaki bilgi düzeyi yaşlı yetişkinlerde fiziksel aktivite ve yaşam kalitesi ile ilişkilidir. Geriatrik semptomların da eşlik ettiği bu kronik hastalıkla uzun yıllar yaşamak zorunda olan bu bireylerin yaşam kalitesini artırmak için eğitim programlarına katılımın teşvik edilmesi ve fiziksel aktivitenin artırılması önemlidir.*

Anahtar Kelimeler: *Diabetes Mellitus, Geriatri, Bilgi, Fiziksel aktivite, Yaşam kalitesi*

INTRODUCTION

Diabetes mellitus (DM) is a group of complex and multifactorial diseases that comprises many disorders characterized by hyperglycemia. Type 2 diabetes mellitus (T2DM) is the predominant diabetes subtype, making up 90–95% of cases. Chronic diabetes is associated with the failure of functions and organs, especially the eyes, kidneys, nerves, blood vessels, and heart. It is a complicated disease that requires continuous medical care (American Diabetes Association, 2018; Cole & Florez, 2020).

Today, diabetes is a health problem that is growing rapidly all over the world. In a study by Cho et al. (2018), the authors estimated that there were 451 million adult people with diabetes worldwide in 2017 and approximately 5 million deaths related to diabetes. In addition, they predicted that diabetes would affect 693 million adults by 2045.

The incidence of T2DM increases with age-associated changes due to increased insulin resistance, pancreatic islet dysfunction, obesity, and increased sedentary behaviors. It has been reported that more than 25% of adults over 65 have diabetes (Centers for Disease Control and Prevention, 2017). Identifying and treating the factors that cause the disease is necessary to reduce the severe life-threatening complications and financial burden as early as possible. In addition, geriatric syndromes and comorbidities, multiple drug use, loss of function, and fragility may accompany the condition in elderly individuals (American Diabetes Association, 2018; Cole & Florez, 2020).

Patients of all ages with diabetes should have sufficient knowledge, skills, and attitudes to manage the disease and gain positive health behaviors successfully. The education and knowledge levels of diabetic patients increase their self-care (Chatterjee et al., 2018; Bukhsh et al., 2019). It has been emphasized that diabetes knowledge level is significantly correlated with the self-care activities and glycated hemoglobin levels of people with DM (Bukhsh et al., 2019).

T2DM can be prevented through lifestyle modification with the physical activity known to be one of the three main management elements of diabetes, in addition to diet and medication. Physical activity can help reduce blood glucose, HbA1c, and the risk of diabetes while also improving cardiovascular risk and quality of life (Jing et al., 2018; Çolak et al., 2016). According to a consensus report by Kanaley et al., (2022) regular aerobic exercise in adults with T2DM reduces overall glycemia by 0.5-0.7%, high-intensity resistance exercise is more beneficial than low- to moderate-intensity resistance training, greater postprandial energy expenditure independent of exercise intensity or type, and ≥45 minutes of activity is most effective. However, various kinds of physical activity, including balance and flexibility exercise, could significantly improve the health and glycemic management of individuals of all ages with T2DM (Kanaley et al., 2022). In addition, physical activity may be influential in improving health and life span in the treatment of DM (Silva et al., 2019). Individualized exercises recommended for geriatric individuals with diabetes mellitus have positive effects on glycemic control, improving independence, self-esteem, and quality of life.

Quality of life assessment is essential in patients with DM, who are under pressure to take control of their treatment and have been shown to have lower levels of quality of life than controls (Rubin & Peyrot, 1999; Awadalla, Ohaeri, Tawfiq & Al-Awadi, 2006). Decreased quality of life effects happiness and satisfaction, compliance with treatment, labor force participation rate, and social functions (Garcia, Villagomez, Brown, Kouzekanani & Hanis, 2001).

Although there are studies in the literature examining physical activity and quality of life in adults with T2DM (Çolak et al., 2016; Silva et al., 2019), there is a limited number of studies examining the relationship between diabetes knowledge, physical activity, and quality of life in individuals over 65 years of age with T2DM. Therefore, this study aims to examine the relationship between diabetes knowledge, physical activity, and quality of life in older adults with T2DM.

MATERIAL AND METHOD

Research Type

The study was descriptive and cross-sectional in design.

Study Population and Sample

Patients with T2DM who attended the internal medicine outpatient clinic at XXX between February 2022 and August 2022 participated. Individuals who volunteered to participate in this study, aged 65 years and over, able to carry out daily living activities independently, and

diagnosed with T2DM at least one year previously were included. The exclusion criteria were (1) diagnosis of type 1 diabetes or other chronic diseases, (2) mental and communication problems, (3) having sleep apnea or another sleep disorder, (4) having acute trauma or surgical treatment in the last six months, (5) taking medication that limited physical activity or caused balance problems, and (6) having neurologic and rheumatologic problems (7) the usage assistive devices for walking.

Data Collection Tools

All data collection forms were performed face-to-face. The patient evaluation form prepared by the researchers contained information on the participants' age, gender, body weight, height, presence of other chronic diseases, education, employment status, time of diagnosis, ongoing treatments, control frequency, family history, and diabetes education.

Participants' level of knowledge of diabetes was assessed by the Diabetes Information Questionnaire (DKQ-24) scale, their level of physical activity was evaluated with the FIT (Frequency Intensity Time) index of Kasari, and their quality of life-related to disease was assessed by the Diabetes-39 (DM-39) Quality of Life Questionnaire. All questionnaires were administered in person in an outpatient setting and took approximately 20 minutes to complete.

Diabetes Information Questionnaire (DKQ-24) Scale: A valid and reliable scale, DKQ-24 assesses the level of patients' diabetes knowledge, their understanding of the causes of their disease, its associated complications, physical activity, diet, and blood glucose levels. It contains 24 questions, 10 assessing basic knowledge, seven referring to glycemic control, and seven relating to complications. There are three options for responses, namely "yes," "no," and "don't know"; one point is awarded for each correct option, and there are no points or negative scoring for incorrect options. Higher scores represent a better level of knowledge (Garcia et al., 2001).

Frequency Intensity Time (FIT): Participants' physical activity levels were assessed using the FIT index of Kasari. The FIT index includes questions about the types of activity, the frequency of exercise per week, and the exercise duration. It is calculated as (points for frequency) × (points for intensity) × (points for time). The total score ranges from 1 to 100 points, with a total score of <36 indicating a low level of physical activity, 36-63 indicating a moderate level, or >63 indicating a high level of physical activity (Yildiz, Tarakci & Mutluay Karantay, 2015).

Diabetes-39 Quality of Life Questionnaire (DM-39): The DM-39 instrument was developed to assess disease and, specifically, quality of life in patients with DM types 1 and 2. It includes 39 items and five dimensions to assess diabetes control (12 items), anxiety/worry (4 items), social burden (5 items), sexual function (3 items), energy/mobility (15 items), and overall quality of life. The answers for each item range from 1 (not affected at all) to 7 (highly affected). Total scores range from 39 to 273, and high scores indicate poor quality of life (Boyer & Earp, 1997). The Turkish validation study of this scale was conducted in 2022 (Buran Çırak et al., 2022).

Ethical Consideration

Institutional and ethical approval was obtained before starting the study. The ethics approval for the study was obtained from the Ethics Committee of Marmara University (Date: 24.02.2022 and No: 29). All participants signed informed consent forms.

Data Analysis

The data obtained in the study were analyzed statistically using IBM SPSS Statistics vn. 23 software (IBM Corpn., Armonk, NY, USA). The results were evaluated at the 95% confidence interval and the significance value at $p<0.05$. The data normal distribution was analyzed with the Kolmogorov–Smirnov test.

Descriptive statistical parameters (mean, median, standard deviation, range, minimum, and maximum) were calculated, and Spearman's correlation analysis was performed.

RESULTS

A total of 188 geriatric individuals with a mean age of 75.2 (range: 65–94) years were included. Most of the patients had been diagnosed with diabetes for 11 years or more and had first- and second-degree relatives with diabetes (Table 1). A majority of the patients were using oral antidiabetics for their treatment. The most common complications related to diabetes were cardiovascular (35.1%) problems.

Table 1. Demographic and Clinical Features

Variables		N (%)
Gender	Female	99 (52.7%)
	Male	89 (47.3%)
Duration of diabetes	1–2 years	28 (14.9%)
	3–5 years	48 (25.5%)
	6–10 years	45 (23.9%)
	More than 11 years	67 (35.6%)
Treatment	Oral antidiabetic medications	82 (43.6%)
	Insulin	56 (29.8%)
	Oral medications replaced with insulin	15 (8%)
	Oral antidiabetic medications + insulin	23 (12.2%)
	Exercise and diet	1 (0.5%)
	Exercise, diet, and oral antidiabetic	7 (3.7%)
	Diet	4 (2.1%)
Current detected complications	Diabetic foot	22 (11.7%)
	Neuropathy	15 (8%)
	Cardiovascular problems	66 (35.1%)
	Kidney problems	43 (22.9%)
	Retinopathy	25 (13.3%)
Education	Illiterate	41 (21.8%)
	Primary school	105 (55.9%)
	Middle school	19 (10.1%)
	High school	12 (6.4%)
	University	7 (3.7%)
	Other	4 (2.1%)
Who does he / she live with?	Alone	13 (6.9%)
	With spouse	69 (36.7%)
	With spouse and children	62 (33%)
	Other	44 (23.4%)
Work status	Working	33 (17.6%)
	Unable to work due to diabetes	7 (3.7%)
	Not working	148 (78.9%)
Frequency of physician visits	Not regular	107 (57%)
	Once a month	12 (6.4%)
	Once in two months	5 (2.7%)
	Once in three months	38 (20.2%)
	Once in six months	12 (6.4%)
	Once in a year	14 (7.4%)
Family health history of diabetes	No history	31 (16.5%)
	First-degree relatives	83 (44.1%)
	Second-degree relatives	48 (25.5%)
	First- and second-degree relatives	26 (13.8%)
Education about diabetes	Never	124 (66%)
	I only participated once, when first diagnosed	16 (8.5%)
	I only participate when I needed to	3 (1.6%)
	I attend group training	2 (1.1%)
	I call my doctor and nurse when I need to	8 (4.3%)
	I learned from my acquaintances	34 (18.1%)
	I use books and the internet	1 (0.5%)

66% of the patients had never been educated about diabetes, and 59.5% of these patients had been living with a diagnosis of diabetes for more than six years. However, 55.3% of the individuals included in the study stated that they would like to receive education about diabetes.

When the evaluation results were analyzed, the participant's knowledge about diabetes, physical activity levels according to the FIT index of Kasari, and D-39 quality of life scores were low (Table 2).

Table 2. Results of Outcome Measurements

Assessment		Mean ± SD Median (min– max)
DKQ-24		10.34 ± 5.49 10 (1–23)
Kasari score		17.12 ± 16.10 10 (1–80)
D-39 total		170.63 ± 3.40 175 (58–259)
D-39 subgroups	**D39 diabetes control**	44.30 ± 9.00 45 (22–84)
	D39 anxiety	13.80 ± 4.50 12 (5–25)
	D39 social life	18.20 ± 4.90 19 (5–30)
	D39 sexual life	7.00 ± 3.30 6 (3–18)
	D39 energy mobility	87.20 ± 29.00 101 (21–120)

DKQ: Diabetes Information Questionnaire-24; D39: Diabetes-39

It was determined that the level of knowledge about diabetes was significantly related to the physical activity score and D-39 quality of life diabetes control subgroup score (p <0.005) (Table 3). There was a statistically significant relationship between the FIT index of Kasari physical activity scores and D-39 quality of life total, diabetes control, and energy mobility subgroup scores (Table 3).

According to the FIT score of the participants, 83% had low, 16% had moderate, and 1% had high physical activity levels. There was a negative correlation between age and the FIT index of Kasari score (p <0.001), and the FIT score was significantly higher in individuals living alone (Kruskal–Wallis test, p <0.001).

When the evaluation results were compared according to gender, it was determined that the level of knowledge about diabetes was higher in females (p = 0.060). However, physical activity (p = 0.030) and quality of life scores were higher in males (p <0.001) (Figure 1).

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Scores for physical activity (p <0.001), quality of life (p <0.001), and level of knowledge about diabetes (p <0.001) were higher in individuals who were still working. It was determined that patients' quality of life scores (p <0.001) decreased as the diagnosis time increased.

Table 3. Correlation Analysis Between the Outcome Measurements

	Kasari FIT score	D-39 Total	D-39 Diabetes control	D-39 Anxiety	D-39 Social life	D-39 Sexual life	D-39 Energy mobility
DKQ-24	**r = 0.901** **p<0.001***	r = -0.098 p = 187	**r = -0.206** **p = 0.006***	r = -0.065 p = 0.378	r = -0.009 p = 0.899	r = -0.091 p = 0.214	r = -0.099 p = 0.177
Kasari score	-	**r = -0.157** **p = 0.031***	**r = -0.211** **p = 0.004***	r = -0.049 p = 0.508	r = -0.031 p = 0.673	r = -0.093 p = 0.202	**r = -0.164** **p = 0.025***

*Spearman correlation test, *p < 0.05, **p < 0.001. D39: Diabetes-39; DKQ: Diabetes Information Questionnaire-24

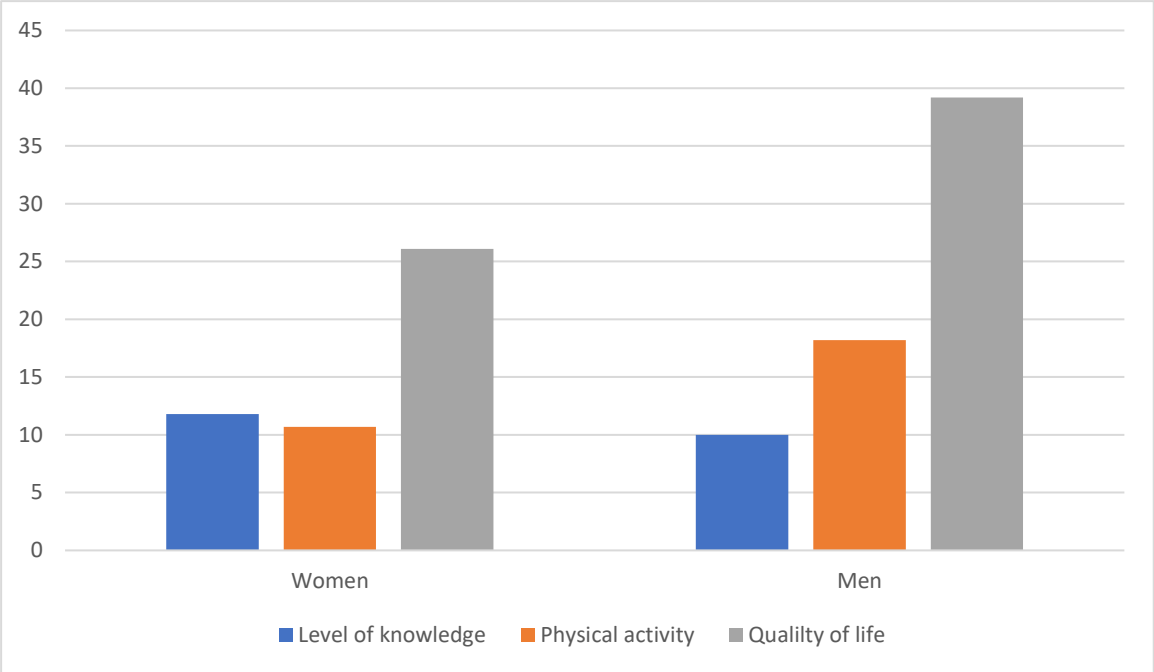

Figure 1. Gender Differences in Outcome Measurements

DISCUSSION

This study demonstrated that senior individuals with diabetes had insufficient knowledge about the disease and that their physical activity levels and quality of life scores were low.

Diabetes self-management education is an ongoing process to facilitate the knowledge, skills, and abilities required for diabetes self-care. It emphasizes the importance of taking a person-centered approach (Powers et al., 2015). Previous studies have shown that education, knowledge about medications, diet, physical activity programs, home glucose monitoring, podiatry, and treatment modifications are essential for effective self-management of diabetes (Padgett, Mumford, Hynes & Carter, 1988; Heise et al., 2022).

Education is one of the essential elements of diabetes and geriatric treatment methods. Although diabetes control education is similar for all ages, it should not be forgotten that most elderly with diabetes face gerontological problems. Diabetes education can be limited because of patients' functional and cognitive issues. Some elderly people with diabetes are high functioning and can perform self-care; others cannot manage their diabetes and need caregivers (Padgett et al., 1988; Yoo, 2017). Therefore, longer training sessions may be required for elderly people with cognitive problems, and caregiver education may be necessary for elderly people who live with caregivers. Yoo (2017) reported that six months of geriatric reinforced education delivered a significant change in the geriatric syndrome state of older diabetics. In the present study, it was determined that 66% of the patients had never been educated about diabetes; however, 55.3% stated that they would like to participate in an education program about diabetes. In future studies, we suggest evaluating the effectiveness of different training programs for different durations.

Nguyen et al. (2020), examined the level of diabetes knowledge in 176 diabetes mellitus patients aged 60 and over. They found that advanced age, low education level, living in rural areas, duration of diabetes, and presence of other diseases were among the factors that negatively affected patients' knowledge, attitudes, and practices. The results of this study determined that as the level of education increased, the level of knowledge also increased. Furthermore, the knowledge level was higher in females. Lemes Dos Santos, Dos Santos, Ferrari, Fonseca & Ferrari, (2014) examined the effect of gender on the level of diabetes-related knowledge by including individuals aged between 18 and 64 years. Similar to this study, the researchers found that women had more knowledge about T2DM.

Physical activity has an essential function in the management of T2DM (Silva et al., 2019; Chen et al., 2019). Chen et al., (2019) analyzed 17,750

T2DM patients (aged 21–94 years) and reported that increased physical activity in total, occupational, and leisure time and decreased sedentary time may have protective effects against metabolic risk in T2DM patients. In the present study, it was observed that 83% of the participants had low, 16% had moderate, and 1% had high physical activity levels. Insufficient physical activity increases the risk of insulin resistance and T2DM. The data analysis demonstrated that physical activity increased as the knowledge level increased. This emphasizes how crucial it is for people with T2DM to learn more about the disease and how important it is to raise awareness among individuals about the importance of physical activity.

Another important issue is decreased physical activity with aging (Silva et al., 2019; Wang et al., 2018). It was confined that the level of physical activity decreased with aging in the cases included in the present study. In addition to being important for diabetes control, physical activity is an essential component of healthy aging, preventing or mitigating falls, osteoporosis, sarcopenia, pain, and cognitive impairment (Jing et al., 2018; Çolak et al., 2016).

Wang et al., (2018) and Nor Shazwani et al., (2010) assessed physical activity levels and patterns in individuals with type T2DM (mean ages 51.9 and 55.1 years, respectively). They reported that the physical activity level of females was higher than that of males. Contrary to these findings, the level of physical activity was higher in males in our study, and physical activity scores were also higher in individuals who were still working and living alone. The higher mean age in our study or cultural differences may have led to this result.

The World Health Organization defines the quality of life as "an individual's perception of their position in life in the context of the culture and value systems in which they live and about their goals, expectations, standards, and concerns." Previous studies have stated that, in general, aging is perceived to decrease quality of life; however, when controlled for other factors, the effects of age may disappear, and older adults are satisfied with their lives today (Netuveli, Wiggins, Hildon, Montgomery & Blane, 2006; Gündoğdu, Tosun & Balci, 2022). In addition, it is known that chronic diseases can affect the quality of life. In the literature, it has been reported that physical inactivity in adult and elderly patients with T2DM negatively affects their quality of life. (Çolak et al., 2016; Gündoğdu et al., 2022). The prevalence of chronic diseases is rising across all age groups, genders, and ethnic groups, making them the leading cause of death worldwide. Even so, more exercise and physical activity are linked to a lower risk of developing chronic diseases. Physical activity and exercise benefit most physiologic systems in the body by preventing primary and secondary diseases, including obesity, diabetes, cancer, lower respiratory disease, cardiovascular disease, and stroke (Anderson & Durstine, 2019).

Similarly, the current study showed increased quality of life scores by increasing physical activity levels. Gundogdu et al. (2022), found that being men, primary school graduates, and cohabiting couples are components of higher physical and mental quality of life scores for geriatric patients with T2DM. Also, in this study, the quality of life scores of males was significantly higher. Gálvez Galán, Cáceres León, Guerrero-Martín, López Jurado & Durán-Gómez (2021), reported that longer duration of diabetes and advanced age were negatively associated with health-related quality of life. Likewise, the patient's quality of life scores decreased as the diagnosis time increased in the present study's population. This relationship may be associated with disease progression, increased complications, and aging.

Limitations

There are several limitations to this cross-sectional study. First, the physical activity of individuals in the same age group without diabetes diagnosis was not assessed in this study. Therefore, it is impossible to evaluate whether the decrease in physical activity was due to age or chronic disease. Second, older adults who applied to only one center were evaluated. Third, physical activity evaluation was made according to the statements of the individuals.

CONCLUSION

In conclusion, the level of knowledge about diabetes is related to physical activity and quality of life scores in elderly adults. It is important to encourage participation in education programs and increase physical activity to improve the quality of life in these individuals who live with this chronic disease for many years while also being accompanied by geriatric symptoms.

Our study results will be helpful in the literature and future clinical applications and research since there is a very limited number of studies on this subject. The implementation and effect of different education programs can be examined in future studies, taking into account age and individuals' social, cultural, and cognitive factors. In addition, different objective methods could be used to measure physical activity.

Ethics Committe Approval

Ethics committee approval was received for this study from the Marmara University Ethics Committee (Date: 24.02.2022, and No: 29).

Author Contributions

Idea/Concept: B.A., T.K.Ç., S.İ.; Design: B.A., T.K.Ç., S.İ.; Supervision/Consulting: B.A., T.K.Ç., S.İ.; Analysis and/or Interpretation: B.A., T.K.Ç., S.İ., B.Ö., A.A.; Literature Search: B.A., T.K.Ç., S.İ., B.Ö., A.A.; Writing the Article: B.A., T.K.Ç., S.İ., B.Ö., A.A.; Critical Review: B.A., T.K.Ç., S.İ., B.Ö., A.A.

Peer-review

Externally peer-reviewed.

Conflict of Interest

The authors have no conflict of interest to declare.

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