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Is the visceral adiposity index associated with the presence of cardiovascular risk scores and comorbidity in psoriatic disease?

Psöriyatik hastalıkta viseral yağlanma indeksi kardiyovasküler risk skorları ve komorbidite ile ilişkili mi?

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Abstract

Objective: The aim of this study was to evaluate the relationship between cardiovascular risk scores and the visceral adiposity index (VAI) in patients with psoriatic disease (PsD).

Methods: A total of 101 PsD patients meeting psoriatic arthritis (CASPAR) criteria and 98 healthy individuals were included in this study. Systematic coronary risk evaluation index (SCORE), Framingham risk score (FS), and VAI values in patients and VAI values in healthy individuals were calculated.

Results: The mean body mass index (BMI) (kg/m²) of the patients was 29.63±5.66. According to the SCORE measurements, the patients were classified as low risk, moderate risk, and high risk-53 (52.5%), 45 (44.6%), and 3 (3%), respectively. No patient was found to be at very high risk. According to the FS, the low-risk, moderate-risk, and high-risk patient rates were 72 (71.3%), 22 (21.8%), and 7 (6.9%), respectively. Statistically significantly higher rates of metabolic syndrome, obesity (BMI >30), and VAI levels were found in the PsA group compared to the healthy control group ($p<0.05$). Statistically significantly higher VAI levels were observed in PsA patients with metabolic syndrome, BMI >30 (obesity), diabetes mellitus, and hypertension compared to patients without these comorbidities ($p<0.05$). A statistically significant correlation was found between low- and moderate-risk FS and VAI levels of PsA patients.

Conclusion: Since VAI can be easily calculated using routine tests, it can provide information about cardiometabolic risks and comorbidities in newly diagnosed PsD patients.

Keywords: Psoriatic disease, psoriatic arthritis, metabolic syndrome, visceral adiposity index, cardiovascular risk

Öz

Amaç: Bu çalışmanın amacı, psöriyatik artriti (PsA) olan hastaların viseral yağlanma indeksi (VAI) ile kardiyovasküler risk skorları arasındaki ilişkiyi değerlendirmektir.

Yöntem: Bu çalışma, PsA sınıflandırma kriterlerini (CASPAR) karşılayan 101 PsA hastası ve 98 sağlıklı gönüllü ile yapılmıştır. Hastaların SCORE, Framingham indeksi (FS) ve VAI değerleri ile sağlıklı bireylerin VAI değerleri hesaplandı.

Bulgular: Ortalama vücut kitle indeksi (VKİ) (kg/m²) 29,63±5,66 olarak hesaplandı. SCORE ölçümlerine göre 53 (%52,5) hasta düşük risk, 45 (%44,6) hasta orta risk ve 3 (%3) hasta yüksek risk altında idi. Hiçbir hasta çok yüksek risk altında değildi. FS'ye göre 72 hasta (%71,3) düşük risk, 22 hasta (%21,8) orta risk ve 7 hasta (%6,9) yüksek risk altındaydı. Metabolik sendrom, obezite (VKİ >30) ve VAI düzeyleri ($p<0,05$) açısından PsA grubunda sağlıklı kontrol grubuna göre risk istatistiksel olarak anlamlı derecede yüksek bulundu. Metabolik sendromlu, (VKİ >30), diabetes mellitus ve hipertansiyonu olan PsA hastalarında, bu komorbiditelerin olmadığı durumlarla karşılaştırıldığında önemli ölçüde daha yüksek VAI seviyeleri saptandı ($p<0,05$). Düşük ve orta riskli FS ile PsA'nın VAI düzeyleri arasında istatistiksel olarak anlamlı bir ilişki belirlendi.

Sonuç: VAI rutin olarak alınan verilerden basitçe hesaplanabildiğinden VAI düzeyi kardiyovasküler riski belirlemek için kullanılabilir ve VAI ayrıca yeni tanı konmuş PsA hastalarında komorbiditeler hakkında ipuçları sağlayabilir.

Anahtar Kelimeler: Psöriyatik hastalık, psöriyatik artrit, metabolik sendrom, viseral yağlanma indeksi, kardiyovasküler risk

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Introduction

Psoriasis (PsD) is an immune-mediated, inflammatory, chronic disease that primarily affects the skin and joints. Although the global incidence and prevalence of PsD are not fully known and vary according to demographic, regional, age, and genetic factors, it is estimated to affect approximately 1-3% of the general population. Despite advances in etiology and treatment, many studies have long shown an association between the severity of PsD and certain comorbidities, such as metabolic syndrome, cardiovascular disease, and obesity. These findings suggest that PsD is not just a skin or joint disease but also a multi-system disease associated with increased morbidity and mortality in the general population.[1,2] Adipose tissue is an active organ with metabolic and endocrine effects, producing adipocytokines such as adiponectin, leptin, resistin, interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), plasminogen activator inhibitor-1, and various growth factors. It interacts with all other organs via adipocytokines.[3,4] Some of these adipokines are anti-inflammatory, while others are pro-inflammatory.[5] Changes in adipokine levels play a role in regulating events such as metabolic balance, immune response to infection and inflammation, and ischemia-induced damage.[6,7] Obesity stimulates the production of certain cytokines, such as IL-6, IL-8, and TNF-α, in adipose tissue. Serum levels of IL-6, IL-8, and TNF-α are known to be elevated in PsD and are associated with disease severity.[8] Levels of adiponectin, an antagonist cytokine against TNF-α, are reduced in obesity and insulin resistance. Recent reports have shown that obesity, insulin resistance, hypertension, and hyperlipidemia are important risk factors for cardiovascular disease and diabetes mellitus.[9,10]

The visceral adiposity index (VAI) is an important sex-specific marker of insulin resistance, adipose tissue function, and distribution. Although visceral fat can be measured using imaging techniques such as magnetic resonance imaging and computed tomography, these techniques are expensive and may not be easily accessible. VAI is easier to use as it is based on anthropometric and metabolic parameters.[11,12]

The aim of this study was to investigate the relationship between disease severity and activity, VAI, Framingham risk score (FS), and systematic coronary risk evaluation index (SCORE) in patients with PsD. In addition, the correlation between disease activity scores and VAI was assessed.

Materials and Methods

This study was conducted with 101 patients with PsA who met the criteria for the Classification of Psoriatic Arthritis (CASPAR).[13] Patients with a history of acute or chronic renal failure, chronic liver disease, cardiovascular disease or heart failure, symptomatic carotid artery disease (CAD) or peripheral artery disease, abdominal aortic aneurysm, nonalcoholic fatty liver disease, malignancy, pregnancy, active infection, chronic obstructive pulmonary disease, or obstructive sleep apnea were excluded from the study. A control group was formed, consisting of 98 age- and gender-matched healthy individuals (31 males, 67 females) who applied to the rheumatology outpatient clinic. The study was approved by the Ankara Numune Training and Research Hospital Clinical Research Ethics Committee (decision no: 1636/2017, date: 06.12.2017). All participants signed a written informed consent form. Demographic and clinical data were recorded. Disease activity was assessed with the health assessment questionnaire (HAQ), disease activity index for psoriatic arthritis (DAPSA), PsD severity index (PASI), bath ankylosing spondylitis disease activity index (BASDAI), and bath ankylosing spondylitis functional index (BASFI). After a 12-hour fasting period, fasting blood glucose (FBG), ESR, C-reactive protein (CRP), total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) levels were analyzed in morning venous blood. Participants' anthropometric measurements, including height, weight, and waist circumference (WC), were taken with light clothing and no shoes, using standard devices. WC was measured at the midpoint between the lowest rib margin and the top of the iliac crest at the end of light expiration. Body mass index (BMI) was calculated by dividing weight (in kilograms) by height squared (in meters). VAI was calculated as follows:

- For men: $VAI=WC/[39.68+(1.88\times BMI)]\times(TG/1.03)\times(1.31/HDL)$
- For women: $VAI=WC/[36.58+(1.89\times BMI)]\times(TG/0.81)\times(1.52/HDL)$.[14]

The updated harmonized diagnostic criteria of the International Diabetes Federation (IDF) were used to diagnose metabolic syndrome (MetS). Participants were considered to have MetS if at least three of the following five criteria were present: 1) abdominal obesity according to population- and country-specific definitions, 2) hypertriglyceridemia (≥150 mg/dL) or use of antilipidemic drugs, 3) low HDLc (≤40 mg/dL in men and ≤50 mg/dL in women) or use of antilipidemic drugs, 4) mean blood pressure ≥130/85 mm Hg or use of antihypertensive drugs, and 5) high fasting glucose (≥100 mg/dL) or use of antidiabetic drugs.[15] To estimate the 10-year risk of a cardiovascular disease event, the FS and the SCORE were used.[16,17] The FS includes age, sex, smoking, blood pressure, and cholesterol concentrations and divides individuals into

three risk categories: low (less than 10% 10-year event risk), intermediate (10% to 20%), and high (greater than 20%). The SCORE equation, calculated from age, gender, smoking, total cholesterol, and systolic blood pressure values, identifies patients at very high CV risk (SCORE >10% with documented CV disease), high CV risk (5%< SCORE < 10%), intermediate CV risk (1%< SCORE <5%), or low CV risk (SCORE <1%).

Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences version 11.0 for Windows software (SPSS Inc., Chicago, IL, USA). The conformity of the data to a normal distribution was assessed using visual and analytical methods and the Shapiro-Wilk test. The distribution of measurable (quantitative) data was given as mean ± standard deviation, and variables that did not show normal distribution were given as median and minimum-maximum values. Student's t-test was used to evaluate the difference between data with a normal distribution, and the Mann-Whitney U test was used for parameters that did not conform to a normal distribution. The chi-square test was used to evaluate categorical variables. Quantitative data were expressed as number (n) and percentage (%). Correlations between numerical data were analyzed using the Spearman correlation coefficient. A p-value <0.05 was considered statistically significant.

Results

The patient group of 101 cases comprised 71 females (70.3%) and 30 males (29.7%) with a mean age of 45.15±13.01 years. The control group of 98 cases comprised 67 females (68.4%) and 31 males (31.6%) with a mean age of 39.3±13.02 years. The demographic and clinical data of the PsA patients are shown in Tables 1 and 2. The PsD duration was 159.10±140.37 months, and PsA disease duration was 64.14±72.75 months. Nail involvement was seen in 46 (45.5%) patients, and 20 (19.8%) patients were tobacco users. In the evaluation of comorbidities, 13 PsA patients had diabetes mellitus, 3 dyslipidemia, 26 hypertension, and 36 metabolic syndrome. No diabetes mellitus, dyslipidemia, or hypertension was determined in the control group. The mean BMI (kg/m²) values of the patient and control groups were 29.63±5.66 and 26.82±6.05, respectively (p<0.001). According to the SCORE measurements, the patients were classified as low risk, moderate risk, and high risk-53 (52.5%), 45 (44.6%), and 3 (3%), respectively. No patient was found to be at very high risk. According to the FS, the low-risk, moderate-risk, and high-risk patient rates were 72 (71.3%), 22 (21.8%), and 7 (6.9%), respectively. In the PsA group, 28 (27.7%) patients had axial involvement, and 89 (88.1%) had peripheral involvement. Dactylitis was determined in 44 (43.6%) patients, and enthesitis in 18 (17.8%).Statistically significantly higher rates of metabolic syndrome, obesity (BMI >30), and VAI levels were found in the PsA group than in the healthy control group (p<0.05) (Table 3).

No correlation was determined between the VAI values of PsA patients and healthy control group subjects with metabolic syndrome and BMI >30 (obesity) (Table 4).The mean age of the patient with MS is older than those without MS and is statistically significant. The number of women in the patient with MS is higher than those without MS

Table 1. Demographic data of patients with PsA

Parameters	PsA (n=101)
Age (mean ± SD)	45.15±13.01
Female/male, n (%)	71 (70.3%) / 30 (29.7%)
PsA disease duration (mean ± SD)	64.14±72.75
Psoriasis disease duration (mean ± SD)	159.10 ± 140.37
BMI (kg/m²) (mean ± SD)	29.63±5.66
Tobacco user, n (%)	20 (19.8%)
Diabetes mellitus, n (%)	13 (12.9%)
Dyslipidemia, n (%)	3 (3%)
Hypertension, n (%)	26 (25.7%)
Metabolic syndrome, n (%)	36 (35.6%)
Disease involvement	
Axial involvement, n (%)	28 (27.7%)
Peripheral involvement, n (%)	89 (88.1%)
Dactylitis, n (%)	44 (43.6%)
Nail involvement, n (%)	46 (45.5%)
Enthesitis, n (%)	18 (17.8%)

BMI: Body mass index, PsA: Psoriatic arthritis, SD: Standard deviation

and is statistically significant. There aren't any differences in disease duration and clinical subtypes of patients with and without MS. VAI levels were found to be statistically significantly higher in PsA patients with BMI >30 (obesity), metabolic syndrome, diabetes mellitus, and hypertension compared to patients without these comorbidities (p<0.05) (Table 5). There was a statistically significant difference in median VAI levels between PsA patients with and without metabolic syndrome [3.37 (1.45-7.81) vs. 1.51 (0.57-5.90), p<0.0001]. No correlation with VAI levels was observed in PsA patients with and without dyslipidemia or smokers and non-smokers.As seen in Table 6, there was a statistically significant correlation between low- and medium-risk FS and VAI levels in PsA patients, but no significant correlation was found with the SCORE index. Correlations were determined between disease activity and cardiovascular and metabolic risks. A weak correlation was found between FS and VAI levels (Table 7). The medications used by patients were recorded. Glucocorticoids were used by 42 (42.6%) patients, non-steroidal anti-inflammatory drugs by 62 (61.4%), methotrexate by 59 (58.4%), leflunomide by 6 (5.9%), salazopyrin by 19 (18.8%), topical steroids by 23 (22.8%), cyclosporine by 1 (1%), and biological agents by 15 (14.9%).

Table 2. Clinical features of patients with PsA

SCORE, n (%)	
Low CV risk SCORE <1%	53 (52.5%)
Moderate CV risk 1% < SCORE <5%	45 (44.6%)
High CV risk 5% < SCORE <10%	3 (3%)
Very high CV risk SCORE >10%	0
Framingham risk score	
Low <10%	72 (71.3%)
Intermediate 10% to 20%	22 (21.8%)
High >20%	7 (6.9%)
ESR (mean ± SD)	19.85±15.21
CRP (mean ± SD)	9.9±15.59
DAPSA (mean ± SD)	22.1±20.6
PASI (mean ± SD)	5.8±10.98
BASDAI (mean ± SD)	3.41±2.52
BASFI (mean ± SD)	1.86±2.18
HAQ (mean ± SD)	0.53±0.56

BASDAI: Bath ankylosing spondylitis disease activity index, BASFI: Bath ankylosing spondylitis functional index, CV: Cardiovascular, CRP: C-reactive protein, DAPSA: Disease activity index for psoriatic arthritis, ESR: Erythrocyte sedimentation rate, HAQ: Health assessment questionnaire, PASI: Psoriasis area severity index, SCORE: Systematic Coronary risk evaluation index

Discussion

In recent years, the relationship between PsD and cardiovascular comorbidities has been extensively studied. This study assessed demographics, disease characteristics, and cardiovascular risk factors, which aligns with findings from other studies while diverging in some areas.

There is an increasing global trend toward obesity for many reasons, including sedentary lifestyles and excessive consumption of fast food. In patients with moderate and severe PsD, psychosocial issues can be as severe as physical problems, affecting quality of life and leading to avoidance of routine activities, resulting in social exclusion and stigmatization. Stigmatized individuals become trapped in a vicious cycle of preferring a sedentary lifestyle, which makes them more susceptible to obesity. Recent studies have shown that people with PsD are not only more prone to obesity but also to metabolic syndrome, insulin resistance, diabetes, dyslipidemia, and cardiovascular disease. While the prevalence of metabolic syndrome in the general population varies from 0.2% to 43.9%, population-based studies have shown a 5-fold increase in patients with PsD.[18] BMI and abdominal obesity have also been reported to increase in PsA and PsD patients.[13,15,16,19,20] In Turkiye, the prevalence of metabolic syndrome has been found to be 33.9% in the general population, 40.6% in patients with PsA, and 53.0% in patients with PsD.[17,21,22]

Table 3. Evaluation of metabolic syndrome, BMI, and VAI levels in PsA and healthy control groups

Parameters		PsA (n=101)	Healthy (n=98)	p
Metabolic syndrome (n/%)	Yes	36 (35.6%)	15 (15.4%)	0.001
	No	65 (64.4%)	83 (84.6%)	
BMI >30 (n/%)	Yes	45 (44.6%)	22 (22.4%)	0.001
	No	56 (55.4%)	76 (77.6%)	
VAI, Median (minimum-maximum)		1.9 (0.57-7.81)	1.5 (0.38-11.08)	0.022

BMI: Body mass index, PsA: Psoriatic arthritis, VAI: Visceral adiposity index

Table 4. Evaluation of VAI in PsA and healthy control groups with metabolic syndrome and obesity

Parameters	VAI value (PsA)	VAI value (healthy control)	p
Presence of metabolic syndrome, mean (± SD)	3.62 (1.72)	4.67 (2.39)	0.08
BMI >30 (obesity), median (minimum-maximum)	2.16 (0.70-7.65)	2.36 (0.7-11.08)	0.3

BMI: Body mass index, PsA: Psoriatic arthritis, SD: Standard deviation, VAI: Visceral adiposity index

In a study by Fernández-Torres et al.[23], obesity was observed in 35.4% of PsD patients. A study by Baeta et al.[24] found an obesity rate of 33.2% among PsD patients, while the current study found that 44.6% of patients were obese. Thus, a high rate of obesity can be seen in this patient group. Therefore, as indicated in many studies, control of body weight is important for the management of this disease.

Table 5. VAI levels in PsA patients with and without comorbidities

Parameters	VAI Median (minimum-maximum)	p
PsA with metabolic syndrome (n=36)	3.37 (1.45-7.81)	<0.0001
PsA without metabolic syndrome (n=65)	1.51 (0.57-5.90)	
PsA with BMI >30 (obesity) (n=45)	2.1 (0.79-7.65)	0.03
PsA without BMI >30 (obesity) (n=56)	1.63 (0.57-7.81)	
PsA with dyslipidemia (n=3)	1.60 (1.48-4.85)	0.82
PsA without dyslipidemia (n=98)	1.91 (0.57-7.81)	
PsA with hypertension (n=26)	2.30 (0.83-7.81)	0.013
PsA without hypertension (n=75)	1.64 (0.57-7.65)	
PsA with diabetes mellitus (n=13)	2.33 (1.48-7.81)	0.024
PsA without diabetes mellitus (n=88)	1.73 (0.57-7.65)	
PsA with smokers (n=20)	1.53 (0.57-4.40)	0.15
PsA without smokers (n=81)	1.94 (0.79-7.81)	

BMI: Body mass index, PsA: Psoriatic arthritis, VAI: Visceral adiposity index

Table 6. VAI levels according to Framingham and SCORE in PsA patients

Parameters	VAI median (minimum-maximum)	p
Framingham score		
Low (n=72)	1.62 (0.57-6.45)	0.03
Intermediate (n=22)	2.89 (1-7.81)	<0.0001
High (n=7)	2.33 (0.83-4.18)	0.388
SCORE		
Low CV risk (n=53)	1.64 (0.79-7.81)	0.058
Moderate CV risk (n=45)	2.15 (0.57-7.65)	0.172
High CV risk (n=3)	1.13 (0.83-1.37)	

CV: Cardiovascular, PsA: Psoriatic arthritis, SCORE: Systematic coronary risk evaluation index, VAI: Visceral adiposity index

In recent years, VAI has emerged as an important gender-dependent marker of insulin resistance, adipose tissue function, and distribution. A high VAI leads to peripheral hyperinsulinemia and insulin resistance. Adipose tissue-derived pro-inflammatory cytokines, including TNF-α, IL-6, and IL-8, play an important role in the pathogenesis of PsD. Production of these pro-inflammatory cytokines increases secondary to obesity and hyperinsulinemia.[3,9,10] In studies related to VAI, it has been used to evaluate polycystic ovary syndrome (PCOS), patients with cardiac or cerebrovascular risk, and chronic hepatitis C.In a study by Androulakis et al.[25], 193 PCOS women were divided into 4 groups according to the severity of menstrual irregularities, and VAI was found to be associated with hyperandrogenism and anovulation. In patients with high VAI levels, an increase in metabolic profile disorders, ovulation disorders, and inflammation was observed.

Petta et al.[26] evaluated 236 patients with genotype 1 chronic hepatitis C and reported that the VAI score increased in association with an increased HCV-RNA burden, steatosis, and inflammation grade. Furthermore, in that study, 44 (18.7%) patients were classified as obese. Based on these data, a high VAI was found to be a marker predictive of higher viral load and severity of inflammation. Another study found that VAI was an important marker of adipose tissue function and distribution and that high VAI levels were an indicator of cardiometabolic risk.[14]

In the present study, the VAI values of PsA patients were found to be statistically significantly higher than those of the control group. However, the VAI values of all patients with metabolic syndrome and BMI >30 (obesity) were found to be higher than the VAI values of the control group. Furthermore, when comparing PsA patients with or without metabolic syndrome, BMI >30 (obesity), hypertension, and DM, VAI values were significantly higher in patients with these comorbidities. In particular, a striking difference in VAI levels was observed in PsA patients with

Table 7. Correlations (r) between disease activity and metabolic and cardiovascular risks of patients

Parameters	BASDAI	PASI	DAPSA	BASFI	HAQ	VAI	SCORE	Framingham risk score
Framingham risk score	0.02	0.095	0.285**	0.202**	0.067	0.299**	0.523	1
SCORE	-0.079	-0.026	0.095	0.065	-0.01	0.058	1	0.523**
VAI	0.128	0.192	0.101	0.105	0.019	1	0.058	0.299**
HAQ	0.129	0.135	0.421**	0.284**	1	0.019	-0.01	0.067
BASFI	0.764**	0.14	0.484**	1	0.284**	0.105	0.065	0.202*
DAPSA	0.462**	0.341**	1	0.484**	0.421**	0.101	0.095	0.285**
PASI	0.092	1	0.341**	0.140	0.135	0.192	-0.026	0.095
BASDAI	1	0.092	0.462**	0.764**	0.129	0.128	-0.079	0.024

**:p<0.05, **:p<0.001*

BASDAI: Bath ankylosing spondylitis disease activity index, BASFI: Bath ankylosing spondylitis functional index, DAPSA: Disease activity index for psoriatic arthritis, HAQ: Health assessment questionnaire, PASI: Psoriasis area severity index, SCORE: Systematic coronary risk evaluation index, VAI: Visceral adiposity index

metabolic syndrome compared to PsA patients without metabolic syndrome. Therefore, VAI may be an indicator of comorbidities (especially metabolic syndrome) in patients with newly diagnosed PsA.

Patients with PsA have an increased risk of atherosclerosis due to endothelial dysfunction resulting from chronic systemic inflammation. Consequently, cardiovascular mortality and morbidity are higher than in the general population. When individual risk factors are added, this risk increases significantly.[27]

In a study by Ernste et al.[28], evaluating the cardiovascular risk profile at the onset of psoriatic arthritis, approximately half of the patients were obese, which aligns with the current study. Additionally, 41 (33%) of 126 patients had FS ≥10%. This study suggested that cardiovascular risk in PsA patients may be higher than anticipated.

In the study by Martinez Vital et al.[27], 3.9% and 25.5% of patients were at very high and high risk, respectively, according to the SCORE index. After carotid ultrasound, the percentage of patients at true very high and high risk changed to 29.4% and 18.6%, respectively, suggesting that the SCORE index may not be sufficient to assess the true cardiovascular risk.

A study by Gisondi et al.[29], involving 234 adult patients with PsD, found that the FS score was significantly higher in PsD patients, although there was no correlation with the severity or duration of PsD.

Another study by Fernández-Torres et al.[23], involving 395 patients with PsD, examined the relationship between cardiovascular risk and PsD characteristics. According to Framingham scoring, 58.2%, 30.5%, and 11.4% of patients were at low, intermediate, and high risk, respectively. There was no correlation between higher risk and severity of PsD and FS. Using the SCORE index, low risk was calculated as 77.9% and high risk as 22.1%.

In the current study, similar to other studies, no association was found between the PsD disease activity score and FS or SCORE. However, as this was a cross-sectional study and patients were receiving treatment, this may explain the lack of association.

Study Limitations

The main limitations of the current study were the small number of patients and the cross-sectional design. Longitudinal studies are needed to obtain more accurate and reliable results.To the best of our knowledge, there are no studies in the literature on VAI in patients with PsD. Since VAI can be easily calculated using routine tests, it can provide valuable information about cardiometabolic risks and comorbidities in newly diagnosed PsD patients.

Conclusion

VAI scores were associated with low and intermediate FS, but the correlations were weak. In addition to the SCORE index and FS, the VAI score can be used to determine cardiovascular risk. The VAI is a parameter that can be easily calculated using simple measurements in the detection of visceral fat, which poses an increased cardiovascular risk beyond being overweight. This index can be suggested as a reliable tool in the assessment of cardiometabolic risk, especially in the absence of overt metabolic syndrome.[30]

Ethics

Ethics Committee Approval: The study was approved by the Ankara Numune Training and Research Hospital Clinical Research Ethics Committee (decision no: 1636/2017, date: 06.12.2017).

Informed Consent: Informed consent form was obtained from all participants in the study.

Footnotes

Authorship Contributions

Concept: A.O., S.Y.Ç., A.Ö., A.E., Design: A.O., S.Y.Ç., S.C.S.,, A.Ö., A.E., Data Collection and Processing: A.O., F.E., S.Y.Ç., S.C.S.,, T.O., A.Ö., Analysis or Interpretation: A.O., S.C.S.,, İ.K., Literature Search: A.O., F.E., S.Y.Ç., S.C.S.,, T.O., İ.K., A.Ö., A.E., Writing: A.O., F.E., İ.K., A.Ö., A.E.

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