

## RESEARCH ARTICLE

- Pinar Yıldız Gulhan<sup>1</sup>**  
**Ozlem Ataoglu<sup>1</sup>**  
**Ege Gulec Balbay<sup>1</sup>**  
**Nevra Ezgi Yasli<sup>1</sup>**  
**Ali Nihat Annakkaya<sup>1</sup>**

<sup>1</sup>Düzce University, Faculty of  
Medicine, Department of  
Pulmonology, Duzce, Turkey

### Corresponding Author:

Pinar Yıldız Gülhan  
Düzce University, Konuralp Campus.  
Faculty of Medicine, Department of  
Pulmonology. 81620 Düzce/Turkey  
E-mail: pinaryildiz691@hotmail.com  
Tel: +90 5059269128

Received: 06.09.2019  
Acceptance: 15-01-2020  
DOI: 10.18521/ktd.629782

Konuralp Medical Journal  
e-ISSN1309-3878  
konuralptipdergi@duzce.edu.tr  
konuralptipdergisi@gmail.com  
www.konuralptipdergi.duzce.edu.tr

## The Evaluation of Eating Attitudes in Patients with Sarcoidosis

### ABSTRACT

**Objective:** The aim of this present study was to investigate the eating attitudes of sarcoidosis patients.

**Methods:** 50 patients with sarcoidosis and 45 healthy individuals without chronic disease were included to study. All participants evaluated for metabolic syndrome (MetS) according to National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III) criteria. Eating Attitude Test (EAT) and Beck Depression Inventory (BDI) were applied to all participants. All participants evaluated for metabolic syndrome (MetS). The cut-off scores of the tests were 30 for BDI and 17 for BDI.

**Results:** When sarcoidosis cases and control group were evaluated according to EAT and BDI cut-off scores; it was found that the prevalence of deterioration in eating behavior was higher in patients with sarcoidosis than healthy controls but the prevalence of depression was not higher ( $p=0.018$ ,  $p=0.874$  respectively). We found that total EAT scores were significantly higher in sarcoidosis patients who has MetS. MetS(-); EAT:  $15\pm 7$ , MetS(+); EAT:  $27\pm 10$   $p<0.001$ .

**Conclusions:** This study is important to show connection between the sarcoidosis and disordered eating attitudes. It is not adequate to establish the presence of comorbidities alone. Defining risk factors leading to comorbidities is also important in patients with sarcoidosis. If causative factors are detected, controlling them by a multidisciplinary approach will prevent the onset of comorbidities and also provide satisfactory management of sarcoidosis.

**Keywords:** Depression, Eating Behavior, Sarcoidosis

## Sarkoidoz Hastalarında Yeme Tutumunun Değerlendirilmesi

### ÖZET

**Amaç:** Bu çalışmanın amacı sarkoidoz hastalarının yeme tutumlarını araştırmaktır.

**Gereç ve Yöntem:** Çalışmaya 50 sarkoidoz tanılı hasta ve kronik hastalığı olmayan 45 sağlıklı birey dahil edildi. Tüm hastalar National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III) kriterlerine göre metabolik sendrom (MetS) açısından değerlendirildi. Tüm katılımcılara Yeme Tutumu Testi (YTT), Beck Depresyon Ölçeği (BDÖ) uygulandı. Testlerin kesme puanları YTT için 30, BDÖ için 17 olarak belirlendi. Hastalar kesme puanlarına göre gruplara ayrıldı.

**Bulgular:** Sarkoidoz olguları ve kontrol grubunun YTT ve BDÖ kesme puanına göre karşılaştırmasında; sarkoidoz hastalarında yeme davranışı bozulma sıklığının arttığını ancak depresyon sıklığının artmadığı görüldü (sırasıyla;  $p=0,018$ - $p=0,874$ ). Sarkoidoz hastalarında YTT skorlarını anlamlı düzeyde yüksek bulundu; MetS(-); EAT:  $15\pm 7$ , MetS(+); EAT:  $27\pm 10$  ( $p<0,001$ ).

**Sonuç:** Çalışmamız sarkoidoz ile düzensiz yeme tutumları arasındaki bağlantıyı göstermek açısından önemlidir. Yalnızca komorbidite varlığını tespit etmek yeterli değildir. Komorbiditelere yol açan risk faktörlerini tanımlamak sarkoidoz hastalarında da önemlidir. Eğer etken faktörler tespit edilirse, onları multidisipliner bir yaklaşımla kontrol etmek, eşlik eden hastalıkların ortaya çıkmasını önler ve ayrıca sarkoidozun daha etkili bir şekilde yönetilmesini sağlar.

**Anahtar Kelimeler:** Depresyon, Sarkoidoz, Yeme Davranışı

## INTRODUCTION

Sarcoidosis is a multisystem granulomatous disorder that can affect all organs. Lung is affected in more than 90% of patients (1,2).

Different ethnic and racial groups show different prevalence, presentation and severity. The sarcoidosis is diagnosed by exclusion of other diseases. A noncaseating granuloma seen in histological examination and compatible clinical picture helps to diagnose (3).

Obesity affects over 300 million people, according to World Health Organization (WHO) data. The prevalence of obesity in various studies it was determined as 35.7% in America, 10-30% between the European Union countries and 26.4% in Turkey (4).

A study made in African-American women it was found that obesity is associated with a higher risk of sarcoidosis prospectively. A subsequent study involving data from The Black Women's Health Study, a 16-year follow-up (1995–2011) study of 59000 African-American women, also assessed the association between obesity and incident sarcoidosis during which 454 cases were reported. It was found that obesity was associated with a 42% increased incidence of sarcoidosis (5).

Eating disorders (ED) are eating behavior disorders that cause medical, social and psychological problems and affect quality of life negatively. Although a specific cause and pathogenesis for eating disorder is not known, it is accepted that risk factors include social, familial, developmental, psychological, behavioral and biological factors and life events (6,7).

Some studies investigated the obesity as a risk factor for sarcoidosis. Determining the risk factors and eliminating them by changing the lifestyle is an important approach for diseases. The aim of the present study was to investigate the eating attitudes in sarcoidosis patients.

## MATERIAL AND METHODS

**Sample of the Study Population:** In our study, 50 patients with sarcoidosis who applied to our outpatient clinic and 45 healthy individuals without chronic disease were included. Participants with psychiatric illness, malignancy, chronic liver diseases, were excluded.

**Ethical Approval:** Ethics committee approval was received for this study from the ethics committee of Duzce University (2019/145). Written informed consent was obtained from all patients who participated in this study.

**Assessments:** Body mass index (BMI) was calculated by measuring the height and weight of the participants. (The body mass index was calculated according to the weight (kg) / height (m) = kg / m<sup>2</sup> = BMI. All patients were evaluated for metabolic syndrome (MetS) according to the National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III) criteria (2).

The presence of three of the five factors defined by ATP III for MetS was accepted as a diagnosis of MetS. Waist circumference was measured at the end of several consecutive natural breaths, at the level parallel to the floor, midpoint between the top of the iliac crest and the lower margin of the last palpable rib in midaxillary line.

Eating Attitude Test (EAT) and Beck Depression Inventory (BDI) were applied to all participants. EAT and BDI results were analyzed according to total score and cut-off values. Participants divided into groups according to cut-off scores; EAT score EAT < 30 and EAT ≥ 30 and to BDI score, BDI < 17 and BDI ≥ 17.

**Lung Function Measurements:** The tests were performed by using a standard spirometer (Vitalograph Alpha, Vitalograph Ltd., Ireland) according to American Thoracic Society criteria, while the patients were at rest and seated in the upright position. A minimum of 3 satisfactory forced expiratory manoeuvres was required for each subject. Forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), FEV1/FVC (%) and maximal mid-expiratory flow rate (MMFR), peak expiratory flow (PEF) were measured. Results were expressed as absolute values and as percentages of predictive values.

**Eating Attitudes Test:** It is a self-report scale used in individuals older than eleven years to measure possible disturbances in eating behaviors in both patients with eating disorders and in individuals without eating disorders (8).

EAT is a scale that can determine the impaired eating behavior and attitude in clinical level. The test consisted of forty items and the cut-off score of the six-point Likert scale was 30. This test was developed to evaluate eating behaviors and attitudes in patients with anorexia nervosa. However, it is used in the determination of eating disorders in normal individuals. The level of total score is directly related to the level of psychopathology. The Turkish validity and reliability of the test was performed (9).

**Beck Depression Inventory:** It measures physical, emotional, cognitive and motivational symptoms of depression. The aim of the scale is not to diagnose depression, but to determine the level and the change in the severity of depression symptoms. BDI is a scale that includes 21 self-assessment sentences and each symptom category has four options. Each item is scored between 0-3 and the total score ranges from 0 to 63 (10). A validity and reliability study was performed in our country. The cut-off point of the Turkish form was determined as 17 (11).

**Statistical Analysis:** Data were analyzed using the Statistical Package for the Social Sciences (Windows version 20.0; SPSS Inc, Chicago [IL], USA). Descriptive statistics (mean, standard deviation, median) of all variables were calculated.

The relationships between quantitative variables were determined by Student T test and One-Way Anova. The relationships between categorical variables were examined by Pearson Chi-Square test. P value <0.05 was considered statistically significant.

### RESULTS

The mean age of the 50 patients with sarcoidosis was 50±12 years and the mean age of

the 45 control groups was 52±8 years. Thirty-seven sarcoidosis patients were female (74%), 13 patients (26%) were male. In the control group; There were 31 (68.9%) female and 14 (31.1%) male.

There was no difference between sarcoidosis cases and controls in terms of age, gender, BMI, EAT total values and BDI total values (Table 1). The stage, treatment status and comorbidities of sarcoidosis cases are given in Table 2.

**Table 1.** Comparison of age, sex, BMI, eating attitude test and beck depression total values between sarcoidosis and control groups

	Sarcoidosis (n=50)	Control (n=45)	p
Age (year, mean±SD)	50±12	52±8	0.446*
BMI (kg/m <sup>2</sup> , ort±SD)	31.3±4.9	31.6±6.5	0.808*
Beck Depression Inventory (mean±SD)	14.1±8	14.3±9	0.888*
Eating Attitudes Test (mean±SD)	22.8±10.7	20±8	0.151*
<b>Gender</b>			
Female (n (%))	37 (74)	31 (68.9)	0.373#
Male (n (%))	13 (26)	14 (31.1)	

\*: Student T test #: Pearson Chi-Square

**Table 2.** General features of sarcoidosis cases

Characteristics of Sarcoidosis Cases	N (%)
<b>Stage</b>	
Stage 1	6 (12)
Stage 2	40 (80)
Stage 3	4 (8)
<b>Steroid Treatment</b>	
Never use	28 (56)
Previously used	16 (32)
Currently using	6 (12)
<b>Hypertension</b>	26 (52)
<b>Diabetes mellitus</b>	14 (28)
<b>Coronary Artery Disease</b>	15 (30)

**Table 3.** Comparison of gender, diabetes mellitus MetS and sarcoidosis with EAT in sarcoidosis patients

Sarcoidosis Patients	Eating Attitudes Test (mean±SD)	p
<b>Sex</b>		
Female (n=37)	26±11	0.002*
Male (n=13)	15±7	
<b>Diabetes mellitus</b>		
No (n=36)	26±7	0.100*
Yes (n=14)	22±12	
<b>Metabolic Syndrome</b>		
No (n=17)	15±7	<0.001*
Yes (n=33)	27±10	
<b>Stage</b>		
Stage 1 (n=6)	20±16	
Stage 2 (n=40)	23±10	0.797\$
Stage 3 (n=4)	21±12	

\*: Student T test \$: One-Way Anova

MetS was present in 64% of sarcoidosis cases (33/50). We found that total EAT scores were significantly higher in sarcoidosis patients who has MetS ( $p < 0.001$ ) (Table 3).

When sarcoidosis cases and control group were evaluated according to EAT and BDI cut-off scores; it was found that the prevalence of

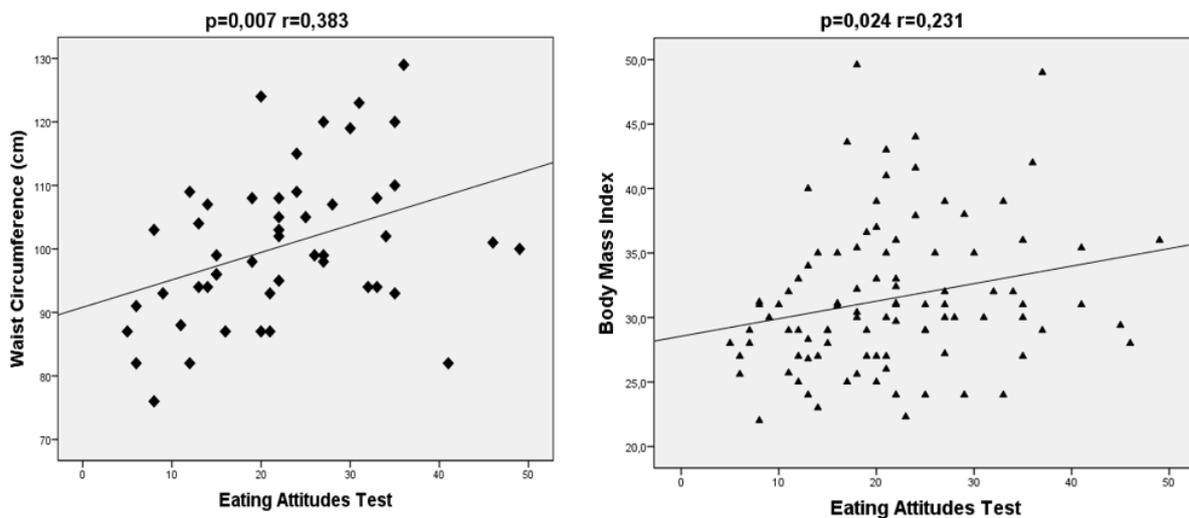
deterioration in eating behavior was higher in patients with sarcoidosis than healthy controls ( $p = 0.018$ ), but the prevalence of depression was not higher ( $p = 0.874$ ). Comparison of sarcoidosis and control groups according to cut-off scores of eating attitude and depression levels is presented in Table 4.

**Table 4.** Comparison of sarcoidosis and control groups according to cut-off scores of eating attitude and depression levels (chi square test)

	Sarcoidosis (n=50)	Control (n=45)	<i>p</i>
<b>Eating Attitudes Test</b>			
<30	36 (%72.2)	41 (%91.1)	0,018
≥30	14 (%27.8)	4 (%8.9)	
<b>Beck Depression Inventory</b>			
<17	33 (%66.0)	29(%64.4)	0.874
≥17	17 (%34.0)	16 (%35.6)	

There was no correlation between pulmonary function test parameters (FVC, FEV1, FEV1 / FVC, PEF, FEF25-75) and EAT in sarcoidosis cases.

In sarcoidosis cases, there was a positive correlation between EAT, BMI ( $p = 0.024$ ,  $r = 0.231$ ) and waist circumference ( $p = 0.007$ ,  $r = 0.383$ ) (pearson correlation analysis) (Figure1).



**Figure 1.** The pearson correlation analysis between EAT and BMI waist circumference

**DISCUSSION**

In this study, between sarcoidosis cases and control group were evaluated according to EAT and BDI cut-off scores; it was found that the prevalence of deterioration in eating behavior was higher in patients with sarcoidosis than healthy controls. In sarcoidosis cases, a positive correlation was found between EAT, BMI and waist circumference. MetS was present in 64% of sarcoidosis cases. We found that total EAT scores were significantly higher in sarcoidosis patients who has MetS. This is the first study that evaluates the eating attitudes and eating behavior disorders in sarcoidosis patients.

The etiology of sarcoidosis is unknown, but the disease includes immunological changes

similar to obesity including TNF- $\alpha$  production. The changing immunology caused by obesity may have a role in the development of sarcoidosis (12). It is well known that adipose tissue, especially white adipose tissue, is not only a storage organ, but also plays an active role in producing and releasing various mediators that may play a role in physiological processes (13).

In some studies examining the relationship between obesity and psychopathology, it has been reported that depressive disorder, anxiety disorders, especially posttraumatic stress disorder, smoking addiction and eating disorders are common in obese individuals (14,15). In our study; We found

positive correlation between EAT, BMI ( $p=0.024$ ,  $r=0.231$ ) and waist circumference ( $p=0.007$ ,  $r=0.383$ ) in sarcoidosis cases.

Immunological mechanisms involved in the pathogenesis of sarcoidosis and MetS; suggested that these two diseases may be the cause or triggers of each other (2,5,16). There are studies linking MetS with eating disorder (17-19). In our study, we found a high rate of eating disorder behavior in sarcoidosis patients with MetS.

In cases where the inflammatory response become chronic or can't balanced, inflammation and cytokines can lead to behavioral symptoms and neuropsychiatric diseases such as major depression and anxiety disorders (20). In a large sample population study (2861 individuals), a positive correlation was found between depression symptoms, anxiety symptoms and IL-6, TNF- $\alpha$  and CRP. In this study, depression and anxiety symptoms were evaluated with scales. It has been suggested that somatic symptoms of depression and anxiety may be associated with inflammation (21). Sarcoidosis is associated with psychological events and psychiatric disorders. This relationship may be due to the fact that sarcoidosis, like most chronic diseases, is associated with long-term symptoms and disabilities.

It is also possible that specific inflammatory mediators directly or indirectly

induce psychological or psychiatric effects in the brain (22). Willemien et al. (23) conducted a study in 274 patients and found a high rate of depression in sarcoidosis patients. But; in our study, we didn't detected depression in sarcoidosis patients and control group. This can be attributed with limited patient count.

The limitation of this study are insufficient number of patients and the tests used in this study are not diagnostic. Despite these limitations, we think that our study contributes to the literature in terms of revealing the relationship between sarcoidosis and impaired eating behavior. There are a lot of preparatory factors that contributes the leading to the emergence of the disease and all of this factors must be capt on mind. In sarcoidosis patients when considering the treating of obesity eating behavior disorders should not be missed.

### CONCLUSION

According to our study, it can be thought that the interaction between sarcoidosis and eating disorders may lead to obesity and similarly, chronic inflammation caused by obesity may lead to activation of sarcoidosis and eating disorder behavior. All preparatory factors that are detected, must be control by a multidisciplinary approach for satisfactory management of sarcoidosis.

### REFERENCES

1. Hunninghake G.W, Costabel U, Ando M et al. ATS/ERS/WASOG statement on sarcoidosis. American Thoracic Society/European Respiratory Society/World Association of Sarcoidosis and other Granulomatous Disorders. *Sarcoidosis Vasc. Diffuse Lung Dis.* 1999;16(2):149-73.
2. Yıldız Gülhan P, Güleç Balbay E, Erçelik M et al. Is sarcoidosis related to metabolic syndrome and insulin resistance? *Aging male* 2020; 23(1): 53-8. [Epub ahead of print]
3. Costabel U, Hunninghake GW. ATS/ERS/WASOG statement on sarcoidosis. Sarcoidosis Statement Committee. American Thoracic Society. European Respiratory Society. World Association for Sarcoidosis and Other Granulomatous Disorders. *Eur Respir J* 1999;14(4):735-7.
4. Sucaklı MH, Çelik M. The Etiology and Epidemiology of Obesit. *Türkiye Klinikleri J Fam Med-Special Topics* 2015;6(3):1-6.
5. Cozier YC, Coogan PF, Govender P et al. Obesity and weight gain in relation to incidence of sarcoidosis in US blackwomen:data from the Black Women's Health Study. *Chest* 2015;147(4):1086-93.
6. Ulaş B, Uncu F, Üner S. Prevalence and Affecting Factors of Potential Eating Disorders Among Students of Health Higher Education. *İnönü Üniversitesi Sağlık Bilimleri Dergisi* 2013;2(2):15-22.
7. Kaya A, Yılmaz A, Demirhan Bİ. The Evaluation of Relationship Between Eating Attitudes and Body Mass Index in Obese Patient. *Euras J Fam Med* 2016;5(3):117-9.
8. Garner DM, Garfinkel PE. The Eating Attitudes Test:An index of the symptoms of anorexia nervosa. *Psychol Med* 1979;9(2):273-79.
9. Savaşır I, Erol N. Yeme Tutum Testi:Anoreksi Nervoza Belirtileri İndeksi. *Psikoloji Dergisi* 1989;7(23):19-25.
10. Beck AT. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4(6):561-71.
11. Hisli N. Beck Depresyon Envanterinin üniversite öğrencileri için geçerliliği ve güvenilirliği. *Psikoloji Dergisi* 1989;7(23):3-13.
12. Harpoe MC, Basit S, Andersson M, et al. Body mass index and risk of autoimmune diseases: a study within the Danish National Birth Cohort. *Int J Epidemiol* 2014;43(3):843-55.
13. Fantuzzi G. Adipose tissue, adipokines, and inflammation. *Journal of Allergy and Clinical Immunology* 2005;115(5):911-20.

14. Black DW, Goldstein RB, Mason EE. Prevalence of mental disorder in 88 morbidly obese bariatric clinic patients. *Am J Psychiatry* 1992;149(2):227-34.
15. Scott KM, McGee MA, Wells JE et al. Obesity and mental disorders in the adult general population. *J Psychosom Res* 2008;64(1):97-105.
16. Cozier CY, Praveen G, Jeffry SB. Obesity and sarcoidosis: consequence or contributor? *Current Opinion in Pulmonary Medicine* 2018;24(5):487-94.
17. Vaag A, Brons C, Apel JS et al. Metabolic consequences of overeating. *Ugeskr Laeger* 2006;168(2):183–7.
18. Hudson JI, Lalonde JK, Coit CE, et al. Longitudinal study of the diagnosis of components of the metabolic syndrome in individuals with binge-eating disorder. *Am J Clin Nutr.* 2010;91(6):1568–73.
19. Herpetz S, Albus C, Wagener R, et al. Comorbidity of diabetes and eating disorders. Does diabetes control reflect disturbed eating behavior? *Diabetes Care* 1998;21(7):1110-6.
20. Gülfizar Sözeri Varma. Neuroinflammatory Hypothesis in Major Depressive Disorder. *Current Approaches in Psychiatry* 2014;6(1):1-9
21. Duivis HE, Vogelzangs N, Kupper N et al. Differential association of somatic and cognitive symptoms of depression and anxiety with inflammation: findings from the Netherlands Study of Depression and Anxiety (NESDA). *Psychoneuroendocrinology* 2013; 38(9):1573-85.
22. Gerke AK, Judson MA, Cozier YC et al. Disease Burden and Variability in Sarcoidosis. *Ann Am Thorac Soc.* 2017; 14(6):421–28.
23. Willemien P. E. de Kleijn, Marjolein Drent, Jolanda De Vries. Nature of fatigue moderates depressive symptoms and anxiety in sarcoidosis. *British Journal of Health Psychology* 2013;18(2):439–52.