Middle Black Sea Journal of Health Science / Mid Blac Sea J Health Sci
November 2022; 8(4):525-532

RESEARCH ARTICLE
DOI: 10.19127/mbsjohs.1126190

Relationship of Demodex Mites in Immunodeficiency, Rocesea, Blepharitis and Some Clinical Findings

Önder Akkaş[1(ID)], Selahattin Aydemir[2(ID)], Esra Gürbüz[3(ID)], Sadeddin Coşkun[4(ID)], Abdurrahman Ekici[2(ID)], Ahmed Galip Halidi[5(ID)], Sevil Alkan[6(ID)]

[1]Department of Medical Microbiology, Erzincan Binali Yıldırım University, Faculty of Medicine, Erzincan, Turkey
[2]Department of Parasitology, Van Yüzüncü Yıl University Faculty of Medicine, Van, Turkey
[3]Department of Infectious Diseases and Clinical Microbiology, Van Training and Research Hospital,Van, Turkey
[4]Department of Dermatology, Van Training and Research Hospital, Van, Turkey
[5]Bulanık Vocational School, Muş Alparslan University, Muş, Turkey
[6]Department of Infectious Disease, Canakkale Onsekiz Mart University, Faculty of Medicine, Çanakkale, Turkey

Received: 06 June 2022, Accepted: 05 Semptember 2022, Published online: 30 November 2022
© Ordu University Institute of Health Sciences, Turkey, 2022

Abstract

Objective: *Demodex folliculorum* and *Demodex brevis* are two species known to settle on the skin of humans. Demodex mite infections are called demodicosis. Demodicosis, which is usually asymptomatic, is known to cause some skin diseases as a result of an imbalance in immune system mechanisms This study was conducted to investigate the relationship between *Demodex* spp. infestations and clinical signs, such as immunodeficiency, rosacea, blepharitis and facial itching, facial flushing, facial tenderness, facial rash, and sunburn.

Methods: A total of 350 patients, 178 of whom were immunosuppressed and 172 who were immunocompetent, were included in the study. Samples were taken from the nose, chin, and forehead areas, using the standard superficial skin biopsy method and were examined under a microscope.

Results: *Demodex* spp. was detected in 224 of the 350 patients, including 144 (80.90%) of the 178 immunosuppressed patients and 88 (51.16%) of the 172 immunocompetent patients included in the study. The difference between *Demodex* spp. positivity in the immunosuppressed patients and positivity in the immunocompetent patients was statistically significant. In addition, a relationship was found between *Demodex* spp. and some clinical symptoms.

Conclusion: *Demodex* spp. proceed a health problem in rosacea and immunosuppressed patients. It was concluded that *Demodex* spp. should definitely be considered in cases of facial sensitivity, facial rash, and facial flushing in both immunosuppressed and immunocompetent patients, especially in the presence of sunburn in immunosuppressed patients, which was revealed by this study.

Keywords: Rosacea, Blepharitis, Demodex

Suggested Citation: Akkaş O, Aydemir S, Gürbüz E, Coşkun S, Ekici A, Halidi A G, Alkan S. Relationship of Demodex mites in immunodeficiency, rocesea, blepharitis and some clinical findings. Mid Blac Sea J Health Sci, 2022; 8(4):525-532.

Copyright@Author(s) - Available online at https://dergipark.org.tr/en/pub/mbsjohs
The content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License,

Address for correspondence/reprints:
Name and Surname: Selahattin Aydemir
Telephone number: +90 (530) 777 87 08
E-mail: saydmr23@gmail.com

INTRODUCTION

Demodex mites are microscopic arthropods that live on the skin of many mammals as well as humans. Unlike other mites, such as house dust mites, they are obligate parasites, and their host specificity is quite high. *Demodex folliculorum* and *Demodex brevis* are two species known to settle on the skin of humans. *D. folliculorum* lives in the follicular infundibulum, while *D. brevis* generally prefers sebaceous duct and meibomian glands. They feed on follicular and sebaceous epithelial cells and sebum. Demodex mites are known as the normal microfauna of hair follicles and sebaceous glands in the skin, but the mites have been reported to destroy epithelial layers with their penetrating mouthparts and claws, causing a lymphocytic infiltration around infested follicles (1,2).

Increased proliferation of Demodex has been associated with the impaired immune status of the host and/or immune response to the mite (3). It has also been suggested that these mites can both create a suitable environment for mite proliferation by showing immunosuppressive effects on the skin and preparing the ground for secondary infections on the skin (3,4). The link between the presence of the mites and the activation of inflammatory pathways is unclear, as the potential of Demodex mites to influence cellular immune-mediated responses has not been fully defined (4) Despite this uncertainty, demodicosis, which is usually asymptomatic, is known to cause some skin diseases as a result of an imbalance in immune system mechanisms (5).

This study was conducted to an evaluation of Demodex positivity and clinical findings such as rosacea, blepharitis and facial itching, facial flushing, facial tenderness, facial rash, and sunburn among immunocompetent and immunocompromised patient groups

METHODS

Sample Group

The study was approved by SBU Van Training and Research Hospital Clinical Research Ethics Committee (19.01.2022/ 02-05). Patients with skin problems who applied to the SBU Van Training and Research Hospital Dermatology outpatient clinic between September and November 2021 were included in the study. A total of 350 patients, 178 of whom were immunosuppressed and 172 who were immunocompetent, were included in the study.

Obtaining and Examining the Sample Materials

Samples were taken from the nose, chin, and forehead areas, defined as the T-zone, using the standard superficial skin biopsy method. While taking the sample, a drop of cyanoacrylate was dripped onto the cellophane tape and adhered to the patient's skin. After waiting for about 1 min, the cellophane tape was removed from the patient's skin and adhered to a slide. Potassium hydroxide (KOH) was dropped between the

cellophane tape and the slide, and the adult, larva, nymph, and egg forms of the mites were examined under 100 and 200 microscope magnification.

Statistical Analysis

Statistical evaluation of the data was done using SPSS Statistics for Windows. The chi-square test was used in the evaluation of categorical data, and $P < 0.05$ was considered statistically significant.

RESULTS

Demodex spp. was detected in 224 of the 350 patients, including 144 (80.90%) of the 178 immunosuppressed patients and 88 (51.16%) of the 172 immunocompetent patients included in the study. The difference between *Demodex* spp. positivity in the immunosuppressed patients and positivity in the immunocompetent patients was statistically significant. There were no statistically significant differences between the age and gender of the patients and *Demodex* spp. (Table 1).

Relationship between demodicosis and clinical manifestations in the immunosuppressed patients

While a statistically significant relationship was found between rosacea and demodicosis in the immunosuppressed patients, no statistically significant relationship was found between blepharitis and demodicosis (Table 2).

A statistically significant relationship was found between facial redness, facial tenderness, facial rash, and sunburn in the immunosuppressed patients and demodicosis, but no significant relationship was found between facial itching and demodicosis (Table 2, Figure 1).

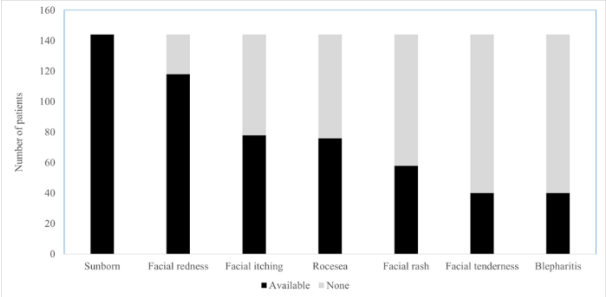

Figure 1. Evaluation of the incidence of *Demodex* spp. and some clinical findings in the immunosuppressed patients

Relationship between demodicosis and clinical manifestations in the immunocompetent patients

In the immunocompetent patients, as in the immunosuppressed patients, a statistically significant relationship was found between rosacea and demodicosis, but no relationship was found between blepharitis and demodicosis (Table 3). A statistically significant relationship was found between facial itching, facial redness, and sunburn, and demodicosis, which were the clinical findings seen in the immunocompetent patients, but no significant relationship was found between facial tenderness and facial rash and demodicosis (Table 3, Figure 2).

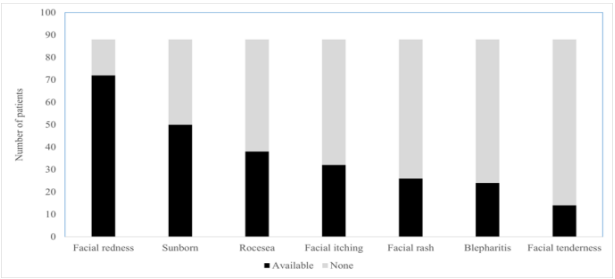

Figure 2. Comparison of the incidence of *Demodex* spp. and some clinical findings in the immunocompetent patients

Table 1. Comparison of the rates of *Demodex* spp. in the different groups.

Group		*Demodex* spp.		*p.*
		Number (n)	Percent (%)	
Research Group	Immunosuppressed (n: 178)	144	80.9	***0.001***
	Immunocompetent (n: 172)	88	51.2	
Age group	0–18 (n: 24)	16	66.7	*0.898*
	19–35 (n: 132)	88	66.7	
	36 and over (n: 194)	128	66	
Gender	Female (n: 273)	182	66.7	*0.127*
	Male (n: 77)	50	64.9	
Total (n: 350)		**232**	**66.3**	

Table 2. Comparison of demodicosis and the clinical signs in immunosuppressed patients.

Clinical Manifestations		*Demodex* spp.		*p.*
		Number (n)	Percent (%)	
Rosacea	Available (n: 78)	76	97.4	***0.001***
	None (n: 100)	68	68	
Blepharitis	Available (n: 47)	40	85.1	*0.392*
	None (n: 131)	104	79.4	
Facial itching	Available (n: 93)	78	83.8	*0.291*
	None (n: 85)	66	77.4	
Facial redness	Available (n: 132)	118	89.4	***0.001***
	None (n: 46)	26	56.5	
Facial tenderness	Available (n: 40)	40	100	***0.001***
	None (n: 138)	104	75.4	
Facial rash	Available (n: 61)	58	95.1	***0.001***
	None (n: 117)	86	73.5	
Sunburn	Available (n: 168)	144	87.3	***0.001***
	None (n: 10)	0	0	

Table 3. Comparison of demodicosis and the clinical signs in immunocompetent patients.

Clinical Manifestations		*Demodex* spp.		*p.*
		Number (n)	Percent (%)	
Rosacea	Available (n: 78)	76	97.4	***0.001***
	None (n: 100)	68	68	
Blepharitis	Available (n: 47)	40	85.1	*0.392*
	None (n: 131)	104	79.4	
Facial itching	Available (n: 93)	78	83.8	*0.291*
	None (n: 85)	66	77.4	
Facial redness	Available (n: 132)	118	89.4	***0.001***
	None (n: 46)	26	56.5	
Facial tenderness	Available (n: 40)	40	100	***0.001***
	None (n: 138)	104	75.4	
Facial rash	Available (n: 61)	58	95.1	***0.001***
	None (n: 117)	86	73.5	
Sunburn	Available (n: 168)	144	87.3	***0.001***
	None (n: 10)	0	0	

DISCUSSION

Demodex mites are organisms of high importance worldwide because they have been shown to be associated with various dermatological conditions in certain conditions and are common in humans (6,7). For this reason, many studies have been conducted on the prevalence of *Demodex* spp. and continue to be performed today. In studies conducted with different patient groups in Turkey, the prevalence of *Demodex* spp. was found to be 26.3%–78%. In some studies, the prevalence of *Demodex* spp. in women (8-11) and in men (12-17) was found to be higher than the opposite sex, but the difference between the sexes was not statistically significant. In this study, *Demodex* spp. was detected in 66.3% of the patients, and there was no statistically significant difference between the incidence of *Demodex* spp. and gender.

In Demodex infestations, symptoms are directly caused by an overpopulation of mites. The Demodex density increases, possibly due to changes in the sebum or immune status (6,7). There is an increase in *Demodex* spp. infestations after immunosuppressive diseases. It has been reported that the frequency of Demodex spp. in patients with hematological malignancies is higher than in control groups18. In this study, the rate of *Demodex* spp. detected in the immunosuppressed patients (80.9%) was higher than in the immunocompetent patients (51.2%). With this result, it was concluded that *Demodex* spp. is still a health problem in immunosuppressed patients and *Demodex* spp. should definitely be considered in this patient group.

Although the etiology of rosacea is not known exactly, it is known that the Demodex mite density is higher in patients with rosacea, and treatment with acaricidal agents is effective in relieving symptoms in these patients (1,19). The relationship between rosacea and Demodex can be explained by two predictions. The first estimation is that rosacea patients have increased blood flow in the papillary dermal vessels, providing a favorable habitat for *Demodex* spp. The second guess is that these mites may mechanically obstruct the follicular opening or vector to microorganisms, contributing to the development of rosacea lesions (19). A meta-analysis of the role of Demodex infestations in rosacea reported that rosacea patients were infested with *Demodex* spp. at a higher rate than the control patients (20). In this study, it was determined that the incidence of *Demodex* spp. was higher in patients with rosacea when compared to the control group, regardless of the immune status of the patients. This result is similar to other studies (1,20,21). It was concluded that *Demodex* spp. is still an important health problem in patients with rosacea.

Although the pathogenicity of Demodex mites is controversial, it has been reported that this parasite has a role in the etiopathogenesis

of many dermatological disorders and may be pathogenic in immunosuppressed patients (22,23). In one study, it was reported that facial erythema, dryness, flaking, and roughness may be a result of *D. folliculorum* proliferation (24). In some studies, it was reported that symptoms such as facial redness, itching, rash, and a burning sensation are associated with *Demodex* spp. Positivity (24-28). In a study examining the relationship between papulopustular rosacea and *Demodex* spp., it was found that the most common clinical symptom in cases with parasites was a burning sensation and rash on the skin (29). In this study, the clinical symptoms in the immunosuppressed patients and clinical symptoms in the immunocompetent patients were evaluated separately. A statistically significant correlation was found between facial flushing and sunburn in both the immunosuppressed patients and the immunocompetent patients and the incidence of *Demodex* spp. In the literature review, no data were found regarding the sunburn sensation of *Demodex* spp. It was determined that all of the patients who were immunosuppressed and found to have *Demodex* spp. had a feeling of burning in the sun. With this study, it was revealed for the first time that *Demodex* spp. caused the feeling of burning in the sun. A statistically significant correlation was found between facial sensitivity and rash symptoms and the incidence of *Demodex* spp. in immunosuppressed patients. All of the patients with immunosuppression and facial sensitivity were found to be *Demodex* spp. positive. In this study, it was concluded that *Demodex* spp. should be considered in the presence of sunburn and facial redness. Another symptom whose relationship with *Demodex* spp. was examined in this study was itching. Many studies have reported that there is a relationship between *Demodex* spp. infestation and itching (24-28). In this study, a significant relationship was found between *Demodex* spp. infestation and itching in the immunocompetent patients, but no such relationship was found in the immunosuppressed patients. According to these results, it can be thought that the feeling of itching is reduced in the case of immunosuppression in these mite infestations, just as pruritus is not observed in immunosuppressed patients in Norwegian scabies (30).

CONCLUSION

Demodex spp. proceed a health problem in rosacea and immunosuppressed patients. It was concluded that *Demodex* spp. should definitely be considered in cases of facial sensitivity, facial rash, and facial flushing in both immunosuppressed and immunocompetent patients, especially in the presence of sunburn in immunosuppressed patients, which was revealed by this study.

Ethics Committee Approval: The study was approved by the SBU Van Training and

Research Hospital Clinical Research Ethics Committee (19/01/2022- 2022/02-05).
Peer-review: Externally peer-reviewed.
Author Contributions:
Concept: ÖA, SA, AE; Design: EG, SC, SA, AE; Literature search: SA, AGH, AE; Data Collection and Processing: EG, SC, ÖA, SA Analysis or Interpretation AE, ÖA, SA; Writing: SA, ÖA, AE
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study hasn't received any financial support.

REFERENCES

1. Forton F. The pathogenic role of Demodex mites in rosacea: a potential therapeutic target already in erythematotelangiectatic Rosacea?. Dermatol Ther. 2020;10(6):1229-53.
2. Aytekin S, Göktay F. Demodicosis. Turkiye Klinikleri J Dermatol-Special Topics. 2015;8(3):35-41.
3. Gazi U, Ozkan AT, Mumcuoglu KY. Immune mechanisms in human and canine demodicosis: a review. Parasite Immunol. 2019;41(12):e12673.
4. Lacey N, Russell-Hallinan A, Zouboulis CC, Powell F. Demodex mites modulate sebocyte immune reaction: possible role in the pathogenesis of rosacea. Br J Dermatol. 2018;179(2):420-30.
5. Rather PA, Hassan I. Human Demodex mite: the versatile mite of dermatological importance. Indian J Dermatol. 2014;59(1):60.
6. Litwin D, Chen W, Dzika E, Korycińska J. Human permanent ectoparasites; recent advances on biology and clinical significance of Demodex mites: narrative review article. Iran J Parasitol. 2017;12(1),12.
7. Foley R, Kelly P, Gatault S, Powell F. Demodex: a skin resident in man and his best friend. J Eur Acad Dermatol Venereol. 2021;35(1):62-72.
8. Yazisiz H, Çekin Y, Koçlar FG. The presence of Demodex Mites in patients with dermatologic symptoms of the face. Turkiye Parazitol Derg. 2019;43(3):143-8.
9. Aycan ÖM, Otlu GH, Karaman Ü, Daldal N, Artambay M. Frequency of Demodicosis in Various Patient and Age Groups. Turkiye Parazitol Derg. 2007;31:115-8.
10. Özdemir MH, Aksoy U, Sönmez E, Akisu C, Yorulmaz C, Hilal A. Prevalence of Demodex in health personnel working in the autopsy room. Am J Forensic Med Pathol. 2005;26:18-23.
11. Sönmez Ö, Yalçın ZG, Karakeçe E, Çiftçi İH, Erdem T. Associations between Demodex species infestation and various types of cancer. Acta Parasitol. 2013;58:551-5.
12. Zhao YE, Guo N, Xun M, Xu JR, Wang M, Wang DL. Sociodemographic characteristics and risk factor analysis of Demodex infestation (Acari: Demodicidae). J Zhejiang Univ Sci B. 2011;12:998-1007.
13. Karaman Ü, Kolören Z, Enginyurt Ö, Özer A. The epidemiology of Demodex mites at the college students living in dormitories in the city of Ordu. Turkiye Parazitol Derg. 2014;38:166-71.
14. Durmaz S, Yula E, Aycan Kaya O, Aksoy Gokmen A, Kılınç C, Atambay M, et al. Sociodemographic characteristics of patients with *Demodex brevis* and *Demodex folliculorum*infestation and its association with rosacea and Behçet's disease. Biomed Res. 2015;26:549-55.
15. Roihu T, Kariniemi AL. Demodex mites in acne rosacea. J Cutan Pathol. 1998;25:550-2.
16. Özdemir H, Özer E, Özdemir S, Alkanat M. The prevalance of Demodex species in faculty of health science students. Arch Turk Dermatol Venereol. 2015;49:139-41.
17. Isa NH, Loong LW, Fang GH, Mohamad AM, Razali N, Rani NI, et al. Demodicosis among university medical students in Malaysia and the effects of facial cleanser and moisturizer usage. S Asian J Trop Med Public Health. 2011;42:1375-80.
18. Zeytun E, Ölmez H. Demodex (Acari: Demodicidae) infestation in patients with KOAH, and the association with immunosuppression. Erzincan University Journal of Science and Technology. 2017;10(2):220-31.
19. Türkmen D, Türkoğlu G. Demodex

infestation in patients with rosacea. Turkiye Parazitol Derg. 2019;43(4):194-7.
20. Chang YS, Huang YC. Role of Demodex mite infestation in rosacea: a systematic review and meta-analysis. J Am Acad Dermatol. 2017;77(3):441-7.
21. Casas C, Paul C, Lahfa M, Livideanu B, Lejeune O, Alvarez-Georges S, et al. Quantification of *Demodex folliculorum*by PCR in rosacea and its relationship to skin innate immune activation. Exp Dermatol. 2012;21(12):906-10.
22. Cengiz ZT, Yilmaz H, Özkol HU, Ekici A, Ödemis N. The prevalence of Demodex sp. in patients admitted to the parasitology laboratory of the Dursun Odabas Medical Center in Yuzuncu Yıl University, Van. Turkish Journal of Parasitology. 2014;38(1):9.
23. Koç AN, Utaş S, Şahin İ, Yılmaz A. The incidence of *Demodex folliculorum*in acne and comedonal dermatoses. Turkish Journal of Parasitology. 1996;20:71-4.
24. Bikowski JB, Del Rosso JQ. Demodex dermatitis: a retrospective analysis of clinical diagnosis and successful treatment with topical crotamiton. J Clin Aesthet Dermatol. 2009;2(1):20.
25. Ertuğ S, Tileklioğlu E, Yıldız İ, Malatyalı E, Ertabaklar H. The retrospective analysis of *Demodex* spp. results in Aydın Adnan Menderes University Faculty of Medicine Hospital Parasitology Laboratory. Turkish Journal of Parasitology. 2020;44(2):72.
26. Elston, Dirk M. Demodex mites: facts and controversies. Clin Dermatol. 2010;28:502-4.
27. Karincaoglu Y, Bayram N, Aycan O, Esrefoglu M. The clinical importance of *Demodex folliculorum* presenting with nonspecific facial signs and symptoms. J Dermatol. 2004;31:618-26.
28. Orak F, Yıldırım D, Set A, Hasbek M. Investigation of Demodex spp. frequency among skin surface biopsy taken from patients. Ankem Derg. 2015;29:90-4.
29. Forton F, Germaux MA, Brasseur T, De Liever A, Laporte M, Mathys C, et al. Demodicosis and rosacea: epidemiology and significance in Daily dermatologic practice. J Am Acad Dermatol. 2005;52:74-87.
30. Türsen B, Türsen Ü. Ivermectin treatment in dermatology. Dermatoz 2015;6.