

Investigation of the Detection Frequency of *Demodex* spp. in Marmara University Faculty of Medicine Students According to Mask Use and Personal Hygiene Habits During the COVID-19 Pandemic

COVID-19 Pandemisi Sırasında Maske Kullanımı ve Kişisel Hijyen Alışkanlıklarına Göre Marmara Üniversitesi Tıp Fakültesi Öğrencilerinde *Demodex* spp. Saptanma Sıklığının İncelenmesi

İD Fatih Mehmet Akıllı¹, İD Büşra Betül Özmen Çapın², İD İhsan Salih Avşar³, İD Taha Ceylan³, İD Nurça Ademoğlu³, İD Sarper Yiğit Göldoğan³, İD Umut Can Dağcı³, İD Arzu İlki²

¹Aksaray Training and Research Hospital, Clinic of Medical Microbiology, Aksaray, Türkiye

²Marmara University Faculty of Medicine, Department of Medical Microbiology, İstanbul, Türkiye

³Marmara University Faculty of Medicine, İstanbul, Türkiye

Cite this article as: Akıllı FM, Özmen Çapın BB, Avşar İS, Ceylan T, Ademoğlu N, Göldoğan SY, et al. Investigation of the frequency of *Demodex* spp. in Marmara University Faculty of Medicine students according to mask use and personal hygiene habits during the COVID-19 pandemic. Türkiye Parazitoloj Derg. 2026;50(3):133-8.

ABSTRACT

Objective: Despite the existence of studies evaluating the effect of personal hygiene habits on *Demodex* mites, which are permanent ectoparasites of humans, there is a paucity of research examining the effect of mask use on the prevalence of *Demodex* mites during the period of the SARS-CoV-2 pandemic. The present study set out to investigate the impact of mask use during the pandemic and personal hygiene habits on the prevalence of *Demodex* spp.

Methods: Standardized skin surface biopsy were obtained from Marmara University Faculty of Medicine students' foreheads and cheeks during the pandemic. Two areas were sampled: foreheads and cheeks. A quantity of immersion oil (ranging from one to two drops) was deposited on the sampled slide area. The slide was covered with a coverslip, then a microscope was investigated (x4, x10 and x40). Infestation was indicated by the presence of five or more *Demodex* per cm². Volunteers were asked to complete a questionnaire about their personal hygiene habits. SPSS v.16.0 (IBM Corp., Armonk, NY, USA) software was used to analyse the results.

Results: A total of 104 volunteers, comprising 43 women and 61 men, participated in the study. *Demodex* spp. was detected in 49.0% (n=51) of the participants, 51.2% (n=22) of women and 47.5% (n=29) of men. *Demodex* spp. were identified in 46.2% (n=48) of the samples obtained from the cheek and 13.5% (n=14) of the samples obtained from the forehead. It was determined that all participants with mites were using masks. The detection frequency exhibited an upward trend in proportion to the duration of mask change. *Demodex* spp. was identified in 52.8% of subjects with a documented history of acne, and a significant correlation was observed between the frequency of facial cleansing and the presence of *Demodex* spp. (p=0.036).

Conclusion: The research indicates that the increase in *Demodex* spp. in the cheeks of individuals using medical masks during the pandemic is attributable.

Keywords: Ectoparasite, SARS-CoV-2, mask

ÖZ

Amaç: İnsanda daimi bir ektoparazit olan *Demodex* spp. akarları ile ilgili kişisel hijyen alışkanlıklarının etkisini değerlendiren çalışmalar literatürde yer almakla birlikte, COVID-19 pandemisi döneminde maske kullanımının *Demodex* spp. yaygınlığı üzerindeki etkisini inceleyen araştırmalar sınırlıdır. Bu çalışmada COVID-19 maske kullanımı ve kişisel hijyen alışkanlıklarının *Demodex* spp. saptanma sıklığını araştırmak amaçlanmıştır.



Address for Correspondence/Yazar Adresi: Fatih Mehmet Akıllı, MD, Aksaray Training and Research Hospital, Clinic of Medical Microbiology, Aksaray, Türkiye

E-mail/E-Posta: drmehmetakilli@gmail.com **ORCID ID:** orcid.org/0000-0001-8541-7742

Received/Geliş Tarihi: 30.07.2025 **Accepted/Kabul Tarihi:** 23.05.2026

Publication Date/Yayınlanma Tarihi: 08.09.2026



Copyright© 2026 The Author(s). Published by Galenos Publishing House on behalf of Turkish Society for Parasitology. This is an open access article under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 (CC BY-NC-ND) International License.

Yöntemler: Marmara Üniversitesi Tıp Fakültesi öğrencilerinden alın ve maske altında kalan yanak bölgesinden standart yüzeysel deri biyopsi örnekleri alınmıştır. Örnekler, lam yüzeyine siyanoakrilat damlatılarak etkenin araştırılacağı yüz bölgesine yapıştırılıp bir dakika beklenerek alınmıştır. Gönüllülerden alın ve yanak olmak üzere iki bölgeden örnek alınmıştır. Lamin örnek alınan kısma 1-2 damla immersiyo yağı damlatılıp lamel ile kapatılarak ışık mikroskopunda x4, x10 ve x40'lık objektiflerde parazit varlığı araştırılmıştır. Cm²'de 5 ve daha fazla *Demodex* spp. görülmesi enfestasyon olarak değerlendirildi. Örnek alımı sırasında gönüllülerden tıbbi maske kullanımı, yüz yıkama sıklığı, makyaj kullanımı gibi kişisel hijyen alışkanlıklarının sorulduğu bir anket doldurmaları istenmiş, bu anket soruları ile örneklerin sonuçları SPSS 16.0 (IBM Corp., Armonk, NY, USA) ile analiz edilmiştir.

Bulgular: Çalışmaya 43 kadın, 61 erkek toplam 104 gönüllü katılmıştır. Katılımcıların %49,0 (n=51)'inde *Demodex* spp. saptanmış olup, kadınların %51,2'si (n=22), erkeklerin %47,5'tir (n=29). Yanaktan alınan örneklerin %46,2 (n=48), alından alınan örneklerin %13,5'ünde (n=14) *Demodex* spp. bulunmuştur. Akar saptanan tüm katılımcıların maske kullandığı belirlenmiştir. Maske değiştirme süresi uzadıkça enfestasyon oranı artış göstermiştir. Akne öyküsü olan katılımcıların %52,8'inde *Demodex* spp. saptanmış olup, yüz yıkama sıklığı ile *Demodex* spp. varlığı arasında anlamlı bir bağlantı bulunmuştur (p=0,036).

Sonuç: Araştırmamız sonucunda yanak bölgesinde *Demodex* spp. saptanma sıklığının daha yüksek olması COVID-19 pandemisi nedeniyle bireylerin uzun süre tıbbi maske kullanımına bağlı olabileceği sonucuna varılmıştır.

Anahtar Kelimeler: Ektoparazit, SARS-CoV-2, maske

INTRODUCTION

Demodex, a permanent ectoparasite in humans, was first detected by Henle in 1841 and described by German dermatologist Gustav Simon in 1842, who demonstrated its ability to exist in pilosebaceous follicles (1). Two distinct types of *Demodex folliculorum* and *Demodex brevis* have been identified in human populations. *Demodex* species are generally found in the face, scalp, hair follicles on the upper chest and sebaceous glands of healthy individuals without any clinical symptoms (2-4). *Demodex* spp. mites have been commonly found to occur in all age groups with the exception of newborns. In the neonatal period, infestation with the mite occurs through direct contact. However, the mite is less prevalent in newborns and children, likely attributable to reduced sebum production in these age groups. Furthermore, an increase in mite density has been observed with age (5,6). *Demodex* prevalence has been observed to increase in advanced age and in patients with immunocompromised. It has been established that *Demodex* spp. density >5/cm² is associated with pathogenicity (3,5,6).

The symptoms appear as the number of mites in the follicles or glands reaches a certain threshold. Mites also penetrate the tissue in immunosuppression and bacterial superinfection cases (7,8). Lesions on the face cause itching, redness and enlarged blood vessels. During the inflammatory phase, these become papules, blisters and pustules. The presence of mites is crucial for diagnosis (7-9).

Skin lesions, especially those present on the face, are characterised by pruritus, erythema, telangiectasia, papules, blisters, and pimples in the area where the mites are found during the inflammatory period. These lesions are important in clinical and diagnostic studies (10,11). Although infestation is most commonly observed in the facial region (forehead, cheeks, nose, chin, nasolabial region) in humans, cases have also been reported in various other parts of the body, including the neck, scalp, ear, trunk, and genital region (3,12-14).

The number of studies planned to reveal the reasons for this difference in *Demodex* spp. prevalence and evaluate risk factors such as sociodemographic data, living conditions, hygiene habits, and skin characteristics of the selected population is limited.

During the COVID-19 pandemic, medical masks were widely used for a long time, and it has been reported that this may lead to changes in skin flora (15-18).

The objective of this study was to ascertain the frequency of *Demodex* infestation in standard superficial skin biopsy (SSSB) samples obtained from Marmara University Faculty of Medicine

students. Moreover, the objective was to ascertain the impact of factors such as the use of medical masks and the diverse personal hygiene practices of the students during the course of the pandemic of the novel strain of SARS-CoV-2 on *Demodex* infestation.

METHODS

This study is a clinical research aiming to determine the prevalence of *Demodex* spp. infestation in Marmara University Faculty of Medicine students and the personal hygiene habits of these individuals. The study was conducted between September 2021 and June 2022 on volunteers randomly selected among Marmara University Faculty of Medicine students.

Participants were asked to complete a questionnaire that included personal hygiene details such as mask use and face-washing habits. Subsequently, SSSB were obtained from cheek regions covered by the mask and the forehead. The samples were collected by applying a drop of cyanoacrylate to the surface of a slide and then pressing the slide once onto the corresponding facial area. Two distinct samples were collected from each participant: one from the forehead and one from the cheek.

A quantity of immersion oil measuring 1-2 drops was deposited on the surface of the sampled slide, which was then covered with a coverslip. The presence of *Demodex* spp. was investigated under x4, x10 and x40 magnification lenses on a light microscope. The presence of more than five mites per square centimetre was considered to indicate an infestation.

This study was conducted in accordance with the principles of good clinical practice as set out in the Declaration of Helsinki. The study was approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (ethics committee no: 09.2022.315, date: 11.02.2022). Written informed consent was obtained from all participants.

Statistical Analysis

The results obtained from the questionnaire data and the samples obtained from the participants were analysed with the SPSS 16.0 (IBM Corp., Armonk, NY, USA) package programme. The investigation focused on the correlation between the independent variables present within the personal information form and the subsequent findings derived from the samples. The dependent variables, i.e. the sampling site (cheek and forehead) were then compared using the McNemar's test. P<0.05 was accepted as statistically significant.

RESULTS

The present study comprised a total of 104 participants, including 43 females and 61 males. *Demodex* infestation was detected in 51 (49.0%) of the 104 participants. The prevalence of infestation in samples collected from male students was 47.5% (n=29), while in female students it was 51.2% (n=22). The distribution of the participants' survey data and infestation rates is presented in Table 1. The presence of *Demodex* spp. was determined in 29.8% (n=62) of all samples (n=208), 13.5% (n=14) of forehead samples (n=104) and 46.2% (n=48) of cheek samples (n=104) ($p < 0.0001$). The presence of infestation was determined in 29.8% (n=62) of all samples (n=208). The light microscopy image of the mites is given in Figure 1.

In the course of the research project, 104 volunteers participated. Of these, 19 (18.3%) volunteers confirmed their use of make-up products. Of these, 18 were female and one was male. Of the 85 respondents who provided a negative response to that question, 25 were female and 60 were male. The infestation rate was 47.4% (n=9) in the samples taken from 19 participants who used make-up products, and 49.4% (n=42) in the samples taken from 85 participants who did not use make-up products. No statistically significant results were found (Table 1). An evaluation was conducted to ascertain the correlation between mask usage and the frequency of mask change, as well as the frequency of *Demodex* infestation. The findings revealed that the majority of participants (n=96) used masks for a duration exceeding four hours, with only eight individuals opting for change intervals of one to four hours. The percentage of infestation in the forehead area was 14.6% (n=14) and in the cheek area was 47.9% (n=46) in the participants whose mask use time was more than 4 hours (n=96). No statistically significant difference was found ($p = 0.212$).

DISCUSSION

The *Demodex* spp. are characterised by a prevalence of colonisation, particularly in the facial region, a phenomenon attributable to a number of factors. It has been established that *D. folliculorum* and, albeit less frequently, *D. brevis* are endemic to humans (1,6). The use of masks has been demonstrated to increase sebum production and to provide a warm and humid environment, thus increasing the frequency and density of *Demodex* mites (15-18).

In order to explain the differences in the prevalence of *Demodex* spp., various studies have been conducted to evaluate risk factors such as sociodemographic characteristics, living conditions,

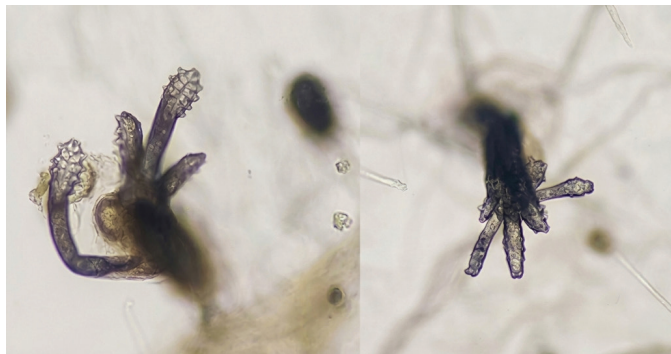


Figure 1. *Demodex* spp. under light microscope x40 magnification

Table 1. Frequency of *Demodex* spp. existence according to different variables

	Positive		p-value
	n	%	
Sex			0.132
Female	22	51.2	
Male	29	47.5	
Variable	n	Positivity (%)	
Total number of samples	208	29.8 (n=62)	-
Samples from forehead	104	13.5 (n=14)	<0.001*
Samples from cheek	104	46.2 (n=48)	-
Age group			0.991
<21 age	49	48.9 (24)	
≥21 age	55	49 (27)	
Face-washing frequency			0,531
Once a day	17	47.1 (n=8)	
More than once a day	87	49.4 (n=43)	
Face-washing product usage			0.578
Yes	66	46.9 (n=31)	
No	38	52.6 (n=20)	
Preferred water temperature for face-washing			0.457
Warm	64	45.3 (n=29)	
Room temperature	36	55.6 (n=20)	
Skin care product usage			0.067
Yes	38	47.4 (n=18)	
No	66	50.0 (n=33)	
Makeup usage			0.678
Yes	19	47.4 (n=9)	
No	85	49.4 (n=42)	
Skin type			0.507
Dry	12	33.3 (n=4)	
Combination	71	50.7 (n=36)	
Oily	21	52.4 (n=11)	
Epilation-laser history			0.580
Yes	12	58.3 (n=7)	
No	92	47.8 (n=44)	
Shaving frequency			0.812
Yes	64	48.4 (n=31)	
Never	40	50.0 (n=20)	
Bath frequency			0.109
1-3 times a week	65	55.4 (n=36)	
Daily	39	38.5 (n=15)	
Shared towel usage			0.773
Yes	13	53.8 (n=7)	
No	91	48.4 (n=44)	
Self-reporterd skin conditions			0.377
Yes	63	52.4 (n=33)	
No	41		
Acne treatment			0.672
Yes	31	45.2 (n=14)	
No	75	50.7 (n=38)	
Antibiotic usage			0.628
Yes	8	62.5 (n=5)	
No	96	47.9 (n=46)	

*: Significant difference

hygiene habits, and skin characteristics of the selected population. Karaman et al. (19) investigated the relationship between gender, age, skin type, frequency of skin care, and the prevalence of *Demodex* spp. in a study involving a total of 300 university students aged 18 to 30. The study reported a prevalence of *Demodex* spp. of 37%, and no significant association was found between *Demodex* spp. prevalence and gender, age, skin type, or frequency of skin care (19).

The number of studies examining the relationship between the frequency of *Demodex* spp. and mask use is quite limited. In one study, the effect of mask type, demographic characteristics, background and face-washing habits of patients on *Demodex* prevalence was examined. It was reported that the use of masks in individuals without underlying skin disease did not create a suitable microenvironment for *Demodex* spp. (20). However, studies have been conducted that suggest a link between mask use and the development of various facial diseases, as well as an increased prevalence of *Demodex* mites (15-18). As stated in the case report, the long-term utilisation of masks has the potential to modify the microenvironment of the skin, thereby increasing the prevalence of *Demodex*-related atopic dermatitis, seborrheic dermatitis, acne vulgaris and rosacea (15).

In studies examining the distribution of mites in the body, it has been reported that infestation in humans is most commonly seen in areas such as the face, forehead, cheeks, nose, chin and nasolabial region, but they can also exist in various other parts of the body such as the neck, scalp, ears, chest, back, breast, buttocks and genitals (3,12-14). The fact that sebum secretion is more intense in the forehead and nose regions causes the follicles in these regions to enlarge more compared to other regions; this has been reported to cause *Demodex* spp. to settle in these regions frequently (21). Studies examining the distribution of the presence of *Demodex* spp. in different regions of the face have yielded different results. In a study by Tilki et al. (22), it was reported that the prevalence of *Demodex* spp. in samples taken from the cheek region was statistically significantly higher than in the nasolabial and chin regions. In our study, similar to the study of Tilki et al. (22) the infestation rate in the cheek region was found significantly higher.

The global prevalence of mask-wearing has increased significantly since the onset of the pandemic, with individuals facing extended periods of mask-use. It has been hypothesised that this situation may result in alterations to the skin's microbial flora (15-18).

Different results were obtained in studies investigating the prevalence of *Demodex* spp. Yazar et al. (23) reported that *Demodex* spp. were detected in 2.9% of 171 university students with the cellophane-tape method and Kaya et al. (24) reported that *Demodex* spp. were detected in 2.7% of 347 male students with the same method. On the other hand, Kaplan et al. (25) reported that parasites were detected in 10.07% of 258 university students, Zeytun et al. (26) in 50.1% of university students (n=538), Özdemir et al. (27) in 47.4% of 270 university students with the SBBB method. In the study conducted by Çetinkaya et al. (28) before the COVID pandemic, the prevalence of the parasite was found to be 35.9% (33/92). They reported that parasites were detected in a single region in 48.5% of individuals with parasites, in two different regions in 42.4%, in three different regions in 6.1%, and in four different regions in 3% (28). It was reported that the presence of parasites was statistically significantly lower in those who used facial cleansing products ($p<0.05$) (28). In our

study, the rate of parasites detected in the cheek region was found to be higher than the samples taken from the forehead region. In our study, we found infestation in a single site (forehead=3, cheek=37) in 40 individuals and in two sites in 11 volunteers. In our study, we found *Demodex* infestation in 51 (49.0 %) of 104 participants in total. *Demodex* infestation has been reported in the literature at rates ranging from 10% to 75% (22). Erdal and Albayrak (4) reported *Demodex* infestation in 21 (14.5%) of 144 patients. However, no significant correlation was found between the frequency of mask change and *Demodex* frequency in our study.

The data obtained from the forehead and cheek regions in the present study indicate a higher existence of *Demodex* spp. (47.9%) in the forehead and cheek regions of 96 volunteers who frequently changed their masks (4+ hours) compared to 8 volunteers who changed their masks (1-4 hours) frequently. In summary, the frequent change of the mask may have resulted in a reduced quantity of *Demodex* in the positive samples obtained from the cheek area. Consequently, the regular replacement of masks during the course of the pandemic may have contributed to a reduction in the prevalence of *Demodex* spp. in humans.

There are studies investigating the relationship between demographic characteristics and parasite prevalence in individuals with *Demodex* spp. infestation. In a study conducted in medical students in China, *Demodex* spp. was found in 21.16% of females and 16.05% of males (29). Tilki et al. (22) found the presence of *Demodex* spp. in 65.5% of men and 60.3% of women in their study investigating the relationship between skin type and characteristics and demographic characteristics of individuals. In our study, *Demodex* spp. infestation was found to be 47.5% in males and 51.2% in females. In previous studies examining the relationship between age and *Demodex* spp. presence, it was reported that the presence of parasite increased with increasing age (2,30). However, no significant relationship was found between age and *Demodex* spp. infestation in our study. It is thought that this may be due to the limited age distribution of the volunteers included in the study.

In the literature, there are different findings and interpretations about the relationship between the frequency of face-washing and the presence of *Demodex* spp. According to the study conducted by Kahraman et al. (31) it was thought that frequent face-washing may lead to dryness in the skin and may decrease the rate of *Demodex* spp. in clean skin. Song et al. (32) found that the prevalence of *Demodex* mites was significantly higher in students who used warm water instead of room temperature water to wash their faces. Yasak Guner et al. (33) reported that there was no significant relationship between the frequency of face-washing and the presence of *Demodex* spp. in their study ($p=0.12$). In our study, no statistically significant difference was found between the frequency of face-washing and water temperature and the frequency of *Demodex* spp. infestation.

The use of make-up products is thought to contribute to the destruction of *Demodex* mites by mechanically occluding the follicle, preventing the migration and respiration of the parasite, and also by toxic effect since they contain antiseptics such as alcohol (33). In our study, no significant difference was observed between the prevalence of *Demodex* spp. in participants who did not wear skin make-up compared to participants who wore make-up.

In a study conducted by Sevgen and Mor (34) it was reported that a higher rate of *Demodex* spp. was detected in individuals who did not have epilation or laser application. However, according to our findings, a higher rate of parasite presence was detected in the samples taken from volunteers who had epilation-laser application compared to those who did not, but this difference was not found to be statistically significant. In this respect, our study is inconsistent with the results of Sevgen and Mor (34). The main limitation of our study are as follows: failure to differentiate *Demodex* mites at species level.

CONCLUSION

In our study, it was evaluated that the higher frequency of *Demodex* spp. infestation in the cheek area may be related to the use of masks, which became widespread during the pandemic period. We think that more long-term studies with a wider participation should be carried out in order to reveal the effect of mask use on the prevalence of *Demodex* spp. infestation more clearly.

*Ethics

Ethics Committee Approval: The study was approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (ethics committee no: 09.2022.315, date: 11.02.2022).

Informed Consent: Written informed consent was obtained from all participants.

*Footnotes

*Authorship Contributions

Concept: B.B.Ö.Ç., A.İ., Design: B.B.Ö.Ç., İ.S.A., T.C., N.A., S.Y.G., U.C.D., A.İ., Data Collection or Processing: B.B.Ö.Ç., İ.S.A., N.A., S.Y.G., U.C.D., A.İ., Analysis or Interpretation: F.M.A., B.B.Ö.Ç., İ.S.A., T.C., N.A., S.Y.G., U.C.D., A.İ., Literature Search: F.M.A., B.B.Ö.Ç., İ.S.A., T.C., N.A., S.Y.G., U.C.D., A.İ., Writing: F.M.A., B.B.Ö.Ç., A.İ.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Yazısız H, Çekin Y, Koçlar FG. The presence of *Demodex* mites in patients with dermatologic symptoms of the face. *Türkiye Parazitol Derg*. 2019; 43: 143-8.
2. Rychlik K, Sternicka J, Zabłotna M, Nowicki RJ, Bieniaszewski L, Purzycka-Bohdan D. The prevalence of *Demodex* spp. infestation in dermatological patients in Northern Poland. *Life (Basel)*. 2024; 14: 1196.
3. Aktaş Karabay E, Aksu Çerman A. *Demodex folliculorum* infestations in common facial dermatoses: acne vulgaris, rosacea, seborrheic dermatitis. *An Bras Dermatol*. 2020; 95: 187-93.
4. Erdal B, Albayrak H. Investigation of the prevalence of *Demodex* spp. in dermatological diseases. *Türkiye Parazitol Derg*. 2022; 46: 54-9.
5. Chudzicka-Strugała I, Gołębiewska I, Brudecki G, Elamin W, Zwoździak B. Demodicosis in different age groups and alternative treatment options-a review. *J Clin Med*. 2023; 12: 1649.
6. Chioveanu FG, Niculet E, Torlac C, Busila C, Tatu AL. Beyond the surface: understanding demodex and its link to blepharitis and facial dermatoses. *Clin Ophthalmol*. 2024; 18: 1801-10.
7. Forton FMN. Rosacea, an infectious disease: why rosacea with papulopustules should be considered a demodicosis. A narrative review. *J Eur Acad Dermatol Venereol*. 2022; 36: 987-1002.
8. Forton FMN. The pathogenic role of *Demodex* mites in rosacea: a potential therapeutic target already in erythematotelangiectatic rosacea? *Dermatol Ther (Heidelb)*. 2020; 10: 1229-53.
9. Geng RSQ, Sood S, Hua N, Chen J, Sibbald RG, Sibbald C. Efficacy of treatments in reducing inflammatory lesion count in rosacea: a systematic review. *J Cutan Med Surg*. 2024; 28: 352-9.
10. Serarslan G, Makbule Kaya Ö, Dirican E. Scale and pustule on dermoscopy of rosacea: a diagnostic clue for *Demodex* species. *Dermatol Pract Concept*. 2021; 11: e2021139.
11. Micheletti RG, James WD, Elston DM, McMahon PJ. *Andrews' Diseases of the Skin Clinical Atlas*. 1st ed. Philadelphia (PA): Elsevier; 2021.
12. Márquez FJ, López-Montoya AJ, Sánchez-Carrión S, Dimov I, de Rojas M. Epidemiological survey of two morphotypes of *Demodex folliculorum* (Prostigmata: Demodicidae) in young people from southern Spain. *Parasite Epidemiol Control*. 2024; 27: e00381.
13. Wei F, Li L, Kong Y, Yan X, Varghese KJ, Zhang S, et al. Evidence for the clinical association between *Demodex* and rosacea: a review. *Dermatology*. 2024; 240: 95-102.
14. Zeytun E, Yazici M. Human *Demodex* mites as a possible etiological factor in rosacea: a cross-sectional study from Turkey. *Syst Appl Acarol*. 2024; 29: 527-38.
15. Paichitrojana A. Demodicosis Associated with wearing a face mask: a case report. *Case Rep Dermatol*. 2022; 14: 19-23.
16. Yu J, Chen JK, Mowad CM, Reeder M, Hylwa S, Chisolm S, et al. Occupational dermatitis to facial personal protective equipment in health care workers: a systematic review. *J Am Acad Dermatol*. 2021; 84: 486-94.
17. Thatiparthi A, Liu J, Martin A, Wu JJ. Adverse effects of COVID-19 and face masks: a systematic review. *J Clin Aesthet Dermatol*. 2021; 14(9 Suppl 1): S39-45.
18. Chiriac AE, Wollina U, Azoicai D. Flare-up of rosacea due to face mask in healthcare workers during COVID-19. *Maedica (Bucur)*. 2020; 15: 416-7.
19. Karaman Ü, Kolören Z, Enginyurt Ö, Özer A. Ordu ilinde yurtlarda kalan üniversite öğrencilerinde *Demodex* türlerinin epidemiyolojisi [The epidemiology of *Demodex* mites at the college students living in dormitories in the city of Ordu]. *Türkiye Parazitol Derg*. 2014; 38: 166-71. Turkish.
20. Aktas ND. Could wearing face masks during the pandemic have created an environment for *Demodex* mites? *Sanamed*. 2024; 19: 155-61.
21. Ertuğ S, Tileklioğlu E, Yıldız İ, Malatyalı E, Ertabaklar H. The retrospective analysis of *Demodex* spp. results in Aydın Adnan Menderes University. *Türkiye Parazitol Derg*. 2020; 44: 72-7.
22. Tilki E, Zeytun E, Doğan S. Prevalence and density of *Demodex folliculorum* and *Demodex brevis* in Erzincan Province. *Türkiye Parazitol Derg*. 2017; 41: 80-6.
23. Yazar S, Özcan H, Çetinkaya Ü. Üniversite öğrencilerinde selofan-bant yöntemi ile *Demodex* sp. araştırılması [Investigation of *Demodex* sp. using cellophane tape method among university students]. *Türkiye Parazitol Derg*. 2008; 32: 238-40. Turkish.
24. Kaya M, Hamamcı B, Çetinkaya Ü, Yaman O, Yazar S. Bir lisede öğrenim gören yabancı uyruklu erkek öğrencilerde selofan-bant yöntemi ile *Demodex* sp. araştırılması [Investigation of *Demodex* sp. using cellophane tape method in foreign male students in a high school]. *Türk Hij Den Biyol Derg*. 2010; 67: 73-7. Turkish.
25. Kaplan M, Keleştemur N, Başpınar S. *Demodex* spp. prevalence among university students. *Kafkas Univ Vet Fak Derg*. 2012; 18(Suppl-A): A43-6.
26. Zeytun E, Tilki E, Doğan S, Mumcuoğlu KY. The effect of skin moisture, pH, and temperature on the density of *Demodex folliculorum* and *Demodex brevis* (Acari: Demodicidae) in students and staff of the Erzincan University, Turkey. *Int J Dermatol*. 2017; 56: 762-6.
27. Özdemir H, Özer E, Özdemir S, Alkanat M. Sağlık bilimleri fakültesi öğrencilerinde demodeks türlerinin görülme sıklığı [The prevalence of *demodex* species in faculty of health sciences students]. *Turkderm*. 2015; 49: 139-41. Turkish.

28. Çetinkaya Ü, Oğuzkaya Artan M, Baykan Z. Sağlık hizmetleri meslek yüksekokulu öğrencilerinde *Demodex* spp. prevalansı ve risk faktörleri [Prevalence and risk factors for *Demodex* spp. in students of vocational school of healthcare services]. Turk Mikrobiyol Cemiy Derg. 2020; 50: 63-9. Turkish.
29. Wang LM, Wang WQ, Shen LJ, Jia XM, Yang ZQ, Li CY, et al. [Investigation on *Demodex* infections among university students in Kunming City]. Zhongguo Xue Xi Chong Bing Fang Zhi Za Zhi. 2020; 32: 428-31. Chinese.
30. Paichitrojjana A. *Demodex*: The worst enemies are the ones that used to be friends. Dermatol Reports. 2022; 14: 9339.
31. Kahraman M, Akın Polat Z, Esen M, Çoban Gül F. The association between the presence of human facial mites *Demodex* (Acari, Demodicidae) and dermatological symptoms in rosacea patients in Central Anatolia, Türkiye. Türkiye Parazitol Derg. 2025; 48: 240-4.
32. Song ZY, Zhang HR, Jiang M, Wang JJ, Guang YJ, Sun H, et al. Prevalence and influencing factors of *Demodex* infection among college students in Zhengzhou, PR China. Southeast Asian J Trop Med Public Health. 2025; 56: 144-59.
33. Yasak Guner R, Tosun M, Akyol M, Hayta SB. *Demodex* infestation as a cause of sensitive skin in a dermatology outpatient clinic. J Cosmet Dermatol. 2022; 21: 1610-5.
34. Sevgen SN, Mor N. Üniversite öğrencilerinde *Demodex* spp. yaygınlığının araştırılması: sağlık bilimleri fakültesi örneği [The investigation of prevalence of *Demodex* spp. in university students: the case of the faculty of health sciences]. Türkiye Parazitol Derg. 2019; 43: 198-203. Turkish.