



# Identification of *Demodex* spp. (Acari: Demodicidae), Prevalence Human Demodicocis, Sociodemographic Characteristics and Associated Risk Factors in Ahvaz County, Southwestern Iran (2022 - 2023)

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## Abstract

**Background:** *Demodex* mite is the most common ectoparasite in humans. *Demodex* infestation or demodicosis often remains asymptomatic, but may be a significant causative agent for many dermatological and ophthalmological conditions. *Demodex* is found in all parts of the human skin, but the majority are on the face. *Demodex brevis* inhabits the bottom of the sebaceous glands. *Demodex folliculorum* is found in the meibomian glands, eyebrows, and eyelashes, and can cause blepharitis. Both of them feed on oil for nutrition.

**Objectives:** The main purpose of this cross-sectional descriptive research was to study the prevalence of human demodicosis and related risk factors in Ahvaz County, southwestern Iran (2022 - 2023).

**Methods:** A total of 225 men and women referring to the Comprehensive Health Center in East Ahvaz were randomly and voluntarily selected. After completing the questionnaire, sampling from four areas of the face (nose, cheeks, chin, and forehead) was performed using the cellophane tape (CTP) and skin pressurization methods to determine *Demodex* infestation and evaluate associated risk factors. The results of this research were statistically analyzed using SPSS software version 13 and chi-square and Fisher's exact tests at a confidence level of 95%.

**Results:** According to the obtained data, *Demodex* infestation in the participants of the study was 52.7% in men and 47.3% in women, and the total detection rate of *Demodex* was 57.3%. The prevalence of demodicosis with methods CTP and skin pressurization was 53.8% and 18.2%, respectively. The difference in infestation rates between the two methods was significant. The highest and lowest infestation rates by facial area were in the nose (50.2%) and chin (6.2%), respectively, with a significant difference among facial regions. The study included participants over 20 years of age, with the highest infestation rate among those aged 51 and above (46.5%). A significant difference in infestation rates was observed across age groups.

**Conclusions:** It was concluded that *Demodex* prevalence increases with age. The CTP is a good sampling method for investigations of demodicosis prevalence.

**Keywords:** Demodicosis, Prevalence, Risk Factors, Sociodemographic Characteristics, *Demodex* Infestation

## 1. Background

*Demodex* species are mites with a cosmopolitan distribution, having adapted to a wide range of climatic conditions, and they represent a significant public health concern, particularly in underdeveloped countries (1). Among the diverse microorganisms residing on and within the human body, *Demodex* mites are among the most common commensal arthropods, predominantly inhabiting the pilosebaceous units of the facial skin (2).

*Demodex* species are permanent ectoparasites belonging to the order *Acarina* of the class *Arachnida* (3). Also, they belong to the family *Demodicidae*, are represented by seven genera, and almost 108 species. More than 100 species of *Demodex* have been identified; however, only two species, *Demodex brevis* (Akbulatova, 1963) and *D. folliculorum* (Simon, 1842), are known to inhabit the human body (4-7). *Demodex* species undergo several developmental stages during their life cycle. Mating occurs between mature males and females approximately half a day after reaching adulthood, after

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which eggs are deposited within hair follicles or sebaceous glands. The six-legged larvae that emerge subsequently pass through two nymphal stages before developing into adults. These mites have a relatively short lifespan, typically ranging from 14 to 18 days, and spend their entire life cycle on the host (8-10).

These mites are predominantly found on the human face, particularly in the regions of the forehead, nose, cheeks, and chin. The most common species affecting human skin are *D. folliculorum* and *D. brevis* (11). *Demodex folliculorum* lives in clusters within the funnel-shaped portion of hair follicles, whereas *D. brevis*, which is shorter in length, inhabits the deeper parts of sebaceous or meibomian glands. Adult *D. folliculorum* is 0.3 - 0.4 mm in length and that of *D. brevis* is 0.15 - 0.2 mm in length. Their bodies are covered with scales and they have pin-like mouth parts for eating oils, skin cells, and hormones gathering in the hair follicles (6). Both species feed on sebum for nutrition and survival. In addition, *D. folliculorum* can be found in the eyebrows, eyelashes, and meibomian glands, where its presence may be associated with *Demodex* blepharitis (3, 4).

*Demodex* mites affect the skin of the nose, forehead, chin, and cheeks, and are characterized by flushing followed by erythema due to capillary dilation, along with papules and pustules resembling acne (12, 13). Several factors have been reported to promote the proliferation of *Demodex* mites. These include age, gender, occupation, education level, using facial cosmetics, personal hygiene, washing the face regularly, immune suppression, environmental stress, hypervasculatization (excessive blood vessel formation), poor personal hygiene, sharing hygiene items (such as towel, soap), high density of sebaceous glands, and hyperplasia (enlargement) of the sebaceous glands. A few studies have investigated the influence of pH, skin moisture, and temperature on the abundance of *Demodex* mites (4, 14-16).

*Demodex* dermatitis is primarily transmitted through the use of shared personal items, close physical contact, and poor hygienic practices. Although these mites typically exist as harmless commensals on the human body, an increase in their numbers can lead to pathogenic effects and cause demodicosis. Demodicosis is most often observed in folliculitis. Depending on the location, it can cause small pustules at the base of a hair shaft on congested, inflamed skin. Demodicosis can also cause swelling, itching, and erythema of the eyelid margins. Under normal conditions, they coexist with

the host without causing pathology; however, factors such as frequent use of cosmetic products on the skin, inadequate facial cleansing, increased sebum secretion (especially with sweating in warm climates), and steroid use can convert them into disease-causing agents.

*Demodex* mites facilitate bacterial proliferation by creating a favorable microenvironment, leading to intense skin reactions, visible pigmentation changes, and abscess formation. These mites play a critical role in the etiology and pathogenesis of several dermatoses, including acne vulgaris (a chronic inflammation of unknown etiology, affecting young adults and characterized by skin with comedones, papules, pustules, nodules, cysts, etc., mostly affecting follicles and sebaceous glands), rosacea (a common skin condition of uncertain etiology, which usually affects the center of the face among the middle-aged, causing transient or permanent facial erythema, telangiectasia, edema, papules, pustules, nodules, and scars), eczema, perioral dermatitis, seborrheic dermatitis (a common condition with uncertain etiology that makes the skin greasy, scaly, and flaky, and occasionally itchy and inflamed; areas of the skin rich in oil-producing glands are often affected, including the scalp, face, and chest), folliculitis (inflammation of the hair follicles of the skin), and blepharitis (characterized by inflammation, swelling, scaling, reddening, burning, itching, and crusting of the eyelid).

Nevertheless, the severity of the pathology varies depending on the age and immune status of the host (8, 17). Comedones are created whenever the preserved keratinous and sebum material close the follicle pore; comedones are thought to be more abundant in people with oily skin (large pores). Demodicosis raises the sebum secretion, making the skin greasier, which is a suitable situation for the expansion of comedones. As a result, it seems that the presence of *Demodex* raises the abundance of comedones (18).

*Demodex* infestation is reported to be up to 80% in people with healthy skin (19), with prevalence potentially increasing in elderly individuals (17). In Iran, studies on *Demodex* infestation have demonstrated prevalence rates ranging from 15.2% in healthy individuals to 68.3% in patients presenting with clinical manifestations (19, 20). The investigation of ectoparasite infestation and the examination of factors involved in their pathogenicity can contribute to the development of improved strategies for their control, reduction of

treatment costs, and combating them in an environmental manner.

The methods used to sample *Demodex* spp. generally include hair epilation, skin scraping, skin pressurization, cellophane tape (CTP) method, skin biopsy, comedo extraction, standard skin surface biopsy, and so on.

## 2. Objectives

The primary objective of this study was to assess the prevalence of *Demodex* ectoparasite infestation among individuals presenting to the Comprehensive Health Center in East of Ahvaz, and to evaluate associated risk factors using two sampling methods: The CTP method (with gentle pressure) and skin pressurization in the year 2022 - 2023.

## 3. Methods

In this cross-sectional descriptive study, according to various studies, the prevalence of *Demodex* infestation was estimated at 38% (11), and assuming a margin of error of 0.02 with a 95% confidence level, a sample size of 225 male and female volunteers was randomly selected from individuals attending the Comprehensive Health Center in East of Ahvaz. The sample size was determined by using a single population proportion formula:

$$n = \frac{Z(1 - \alpha/2)^2 \times P(1 - P)}{d^2} = \frac{1.96^2 \times 0.38(1 - 0.38)}{0.02^2} = 225$$

Signed consent forms were collected from the participants after the study was fully explained to them. Ethical permission was not required for this study because the skin pressurization and CTP methods were two non-invasive sampling techniques routinely used in etiological agent investigations. Confidentiality of the data was retained at all levels of the research. The study was conducted in accordance with the principles of the Declaration of Helsinki. Exclusion criteria included individuals who had received any topical or related treatments within the past month.

Each person was interviewed individually. The questionnaire was filled out by face-to-face interview. The information on age, gender, family address, telephone number, occupation, literacy level, skin type, skin disease, use of facial cleaner, use of cosmetics, sanitary ware sharing, and frequency of face-wash per day were collected in the study.

After completing the questionnaire, samples were collected from four facial regions (nose, cheek, chin, and forehead) using two methods: The CTP (scotch tape) method with very mild pressure and the skin pressurization method (pressure technique). Sampling was preferred particularly in areas with skin lesions. The patients' faces were cleaned with alcohol or washed with warm water (to remove any residual cream or lotion) and allowed to air dry.

For the pressure technique, the skin in the specified areas (about 1 cm<sup>2</sup>) was compressed using the thumb, and the expressed sebum was collected onto a glass slide. Samples were placed directly on a clean slide, followed by the application of one or two drops of 10 - 20% potassium hydroxide solution [other materials that can be used include: Glycerin, lactophenol, liquid paraffin, or Hoyer solution for the permanent slides (20 mL of glycerin, 30 g of crystalline gum Arabic, 50 ml of distilled water, and 200 g of chloral hydrate)] for clearing. After placing a coverslip on the slide containing the sample, microscopic examination at magnifications of 4x, 10x, and 40x was performed for the presence of *Demodex* mites during two to three hours. Then, slides were coded. Each participant had four slides prepared.

For sampling using the CTP method (with slight pressure), all participants were instructed to apply pieces of transparent adhesive tape approximately 2 cm × 5 cm to the forehead, cheek, chin, and nose at night before bedtime. The tape was pressed gently to ensure better contact with the skin. The following morning, the tape strips were removed from the face and pressed onto microscope slides (one slide per sampled area, four slides per individual) for subsequent analysis. Lastly, the tapes were observed under an optical microscope.

Positive samples were photographed, and identification of *Demodex* mites was performed by comparing their morphological characteristics and parameters described in the literature and standard references (21, 22). A positive diagnosis was made only after visualizing the *Demodex* mites (any of the developmental stages: Egg, larva, nymph, adult of *D. folliculorum* or *D. brevis*) under microscope magnification. The infestation intensity was classified based on the number of mites counted per individual across eight slides into three categories: Mild (1 - 8 mites/8 slides), moderate (9 - 18 mites/8 slides), and severe (19 or more mites/8 slides).

The research findings were analyzed using descriptive statistics (frequency and percentage) and analytical statistics with Fisher's exact and chi-square tests in SPSS for Windows version 13.0 software (SPSS Inc., Chicago, IL, USA).

#### 4. Results

In the study population of 225 randomly selected individuals, laboratory examinations and clinical assessments identified 129 cases of *Demodex* infestation, with a prevalence rate of 57.3%. All infested individuals were affected with *D. folliculorum* (Figure 1); *D. brevis* was not detected in this study. The gender distribution of infested cases was 50.3% female and 49.7% male, with no statistically significant difference between sexes ( $P = 0.59$ ). The study included participants over 20 years of age, with the highest infestation rate among those aged 51 and above (46.5%). A significant difference in infestation rates was observed across age groups ( $P < 0.001$ ).



Figure 1. *Demodex* mites in facial sampling

Regarding education level, the majority of participants (56.5%) had a university education; similarly, 44.2% of infested individuals were university educated, but no significant difference in infestation prevalence was found based on education level ( $P = 0.06$ ). Occupational status was also evaluated, with housewives showing the highest infestation rate (45.8%), and a significant difference in infestation among different occupations ( $P < 0.001$ ). Skin types were categorized as dry, normal, and oily, with the highest infestation prevalence (40.4%) among individuals with oily skin, showing a significant difference ( $P < 0.001$ ).

Among users and non-users of facial cleansing agents, infestation rates were 38% and 62%, respectively, indicating a significant difference ( $P < 0.001$ ).

Infestation rates among users and non-users of cosmetic products were 60.5% and 39.5%, respectively, with a significant difference ( $P < 0.001$ ). Participants using personal versus shared hygiene products had infestation rates of 31.1% and 68.9%, respectively, with a statistically significant difference ( $P < 0.001$ ). Frequency of facial washing was assessed, with 56.6% of infested individuals washing their face once daily, and a significant difference was observed compared to those washing two or more times daily ( $P < 0.001$ ).

Individuals with acne and pimples represented the highest infestation among skin disease groups (46.5%), with significant differences in infestation rates among various skin disease patients ( $P < 0.001$ ). Infestation severity, classified by mite count on eight slides, showed 72.1% of individuals with mild infestation; differences among mild, moderate, and severe infestation categories were statistically significant ( $P < 0.001$ , Table 1). The highest and lowest infestation rates by facial area were in the nose (50.2%) and chin (6.2%), respectively, with a significant difference among facial regions ( $P < 0.001$ ). The difference in infestation rates between CTP (with slight pressure) and skin pressure methods (Figure 2) was also significant ( $P < 0.001$ , Table 2).



Figure 2. Steps for sampling by skin pressurization method from four areas of the face

#### 5. Discussion

In the present study, the overall prevalence of *Demodex* infestation in the study population was determined to be 57.3%. The detection rate of *Demodex* using the CTP method was 53.8%, while the skin squeezing method yielded a detection rate of 18.2%.

*Demodex* infestation is considered common. Other studies have shown that 10% to 80% of healthy

**Table 1.** *Demodex* spp. Positivity According to Sociodemographic Characteristics and Associated Risk Factors, Ahvaz County, Iran (2022-2023)<sup>a</sup>

Characteristics and Descriptions	Distribution	Prevalence of <i>Demodex</i>	Test	PValue
<b>Gender</b>			Fisher exact	0.59
Male	112 (49.7)	68 (52.7)		
Female	113 (50.3)	61 (47.3)		
<b>Age (y)</b>			Chi-square	< 0.001 <sup>b</sup>
20 - 35	63 (28.0)	31 (24.0)		
36 - 51	99 (44.0)	38 (29.5)		
≥ 51	63 (28.0)	60 (46.5)		
<b>Literacy level</b>			Chi-square	0.06
Under diploma	65 (28.8)	51 (39.5)		
Diploma	33 (14.7)	21 (16.3)		
Collegiate	127 (56.5)	57 (44.2)		
<b>Occupation</b>			Chi-square	< 0.001 <sup>b</sup>
Housewife	105 (46.7)	59 (45.8)		
Worker	13 (5.8)	10 (7.8)		
Self-employment	26 (11.6)	8 (6.2)		
Farmer	14 (6.2)	11 (8.5)		
Unemployed	13 (5.8)	6 (4.6)		
University student	21 (9.3)	14 (10.9)		
Government employee	30 (13.3)	19 (14.7)		
Other	3 (1.3)	2 (1.5)		
<b>Skin type</b>			Chi-square	< 0.001 <sup>b</sup>
Dry	54 (24.0)	33 (25.5)		
Neutral	99 (44.0)	44 (34.1)		
Oily	72 (32.0)	52 (40.4)		
<b>Skin disease</b>			Fisher exact	< 0.001 <sup>b</sup>
Yes	180 (80.0)	121 (93.8)		
No	45 (20.0)	8 (6.2)		
<b>Use of facial cleaner</b>			Fisher exact	< 0.001 <sup>b</sup>
Yes	162 (72.0)	80 (38.0)		
No	63 (28.0)	49 (62.0)		
<b>Using cosmetics</b>			Fisher exact	0.01 <sup>b</sup>
Yes	135 (60.0)	78 (60.5)		
No	90 (40.0)	51 (39.5)		
<b>Sharing sanitary ware</b>			Fisher exact	0.002 <sup>b</sup>
Shared	153 (68.0)	89 (68.9)		
Unshared	72 (32.0)	40 (31.1)		
<b>Frequency of face-wash (d)</b>			Chi-square	< 0.001 <sup>b</sup>
1	81 (36.0)	73 (56.6)		
2	108 (48.0)	41 (31.8)		
≥ 3	36 (16.0)	15 (11.6)		
<b>Skin disease</b>			Chi-square	< 0.001 <sup>b</sup>
Acne and pimple	89 (39.6)	60 (46.5)		
Dermatitis	9 (4.0)	6 (4.7)		
Rosacea	15 (6.6)	13 (10.1)		
Blepharitis	13 (5.8)	8 (6.2)		
Redness	23 (10.2)	16 (12.4)		
Itching	18 (8.0)	11 (8.5)		
Flacking	13 (5.8)	7 (5.4)		
None	45 (20)	8 (6.2)		
<b>Degree of infestation</b>			Chi-square	< 0.001 <sup>b</sup>
Mild	-	93 (72.1)		
Moderate	-	27 (20.9)		
Severe	-	9 (7.0)		
<b>Degree of infestation in people with skin disease</b>			Chi-square	< 0.001 <sup>b</sup>
Mild	-	66 (51.1)		
Moderate	-	34 (34.1)		
Severe	-	19 (4.7)		

<sup>a</sup> Values are expressed as No. (%).<sup>b</sup> The difference was statistically significant.

individuals (without clinical cutaneous manifestations) may be infested with *Demodex* (5). In two large studies conducted in China, the detection rate was reported to be 67.6% among 756 university and school students (aged 13 to 22 years) using the CTP method, and 43% in 860 patients with dermatosis (aged 12 to 84 years) using the skin squeezing method (15, 23). In a study by Shokrani et al. on 100 college students in Khorramabad (western Iran), the overall prevalence of *Demodex*

infestation was 55%. The detection rate by CTP method (52%) was significantly higher than that by the skin squeezing method (17%) (24). The CTP method is considered an appropriate and non-invasive technique for epidemiological studies. This method is designed based on the parasite's biology, considering its movement and mating behavior at night.

All specimens found in this study were *D. folliculorum*. This is in agreement with other research where *D.*

**Table 2.** *Demodex* spp. Infestation by Sampling Method and Facial Area in Ahvaz County, Iran (2022-2023)<sup>a</sup>

Characteristics and Description	Distribution	Prevalence of <i>Demodex</i>	Test	P-Value <sup>b</sup>
<b>Checkpoint</b>			Chi-square	< 0.001
Nose	225 (100)	113 (50.2)		
Cheek	225 (100)	22 (9.8)		
Chin	225 (100)	14 (6.2)		
Forehead	225 (100)	81 (36.0)		
<b>Detection method</b>			Chi-square	< 0.001
CTP with a slight squeezing	225 (100)	121 (53.8)		
Skin pressurization	225 (100)	41 (18.2)		

Abbreviation: CTP, cellophane tape.

<sup>a</sup> Values are expressed as No. (%).

<sup>b</sup> The difference was statistically significant.

*folliculorum* was the most abundant species (4). It is completely feasible that *D. folliculorum* is more abundant in human skin; although, the fact that it lives in the hair follicles makes finding it simpler than *D. brevis*, which lives in the deeper sebaceous and meibomian glands. Therefore, it is not always feasible to detect *D. brevis* except when it creeps onto the skin level during the night.

In the present study, the prevalence of *Demodex* infestation among males was 52.7%, with no statistically significant difference compared to females. In several other studies, the association between gender and *Demodex* infestation was also found to be statistically insignificant (5, 25). However, in the study conducted by Shokrani et al., the prevalence of *Demodex* infestation was significantly higher in males (66%) than in females (44%) (24). This finding can be attributed to the higher number of sebaceous glands in males, which may favor *Demodex* proliferation (26).

The present study was conducted among individuals aged over 20 years. The highest prevalence of *Demodex* infestation was observed in the age group of 51 years and above (46.5%), and a statistically significant difference was found in the frequency of infestation among different age groups. Similarly, other studies have also demonstrated that the prevalence of *Demodex* infestation increases with age. Due to the low sebum secretion in children, the mite is rarely observed in this group (8, 27, 28). In another study, the prevalence of *Demodex* infestation was approximately 95% in individuals over 71 years old, 69% among those aged 31 to 50 years, and only 13% in children aged 3 to 15 years (29). Several studies have indicated that the highest

prevalence of *Demodex* infestation occurs between the ages of 30 and 60 years (30). The findings of the present study are consistent with those of previous research.

In our results, 32.0% of the total study population had oily skin. Among the 129 individuals diagnosed with *Demodex* infestation, 44.4% had oily skin, and a statistically significant difference was observed compared to those with normal or dry skin. Since *Demodex* mites typically inhabit sebaceous glands or hair follicles, oily skin provides a favorable environment for their colonization and proliferation. This is because sebaceous glands can supply abundant nutrients necessary for the reproduction of *Demodex* (6). In the study by Shokrani et al., the highest prevalence of infestation was reported among individuals with oily skin (67.5%) (24). Similarly, in a study conducted by Zhao et al. in China, the highest rate of infestation (48.8%) was also found in participants with oily skin (23). The findings of the present study are consistent with those of previous research. Some studies have also reported a sensation of skin dryness in individuals with severe *Demodex* infestation, which is likely due to blockage of sebaceous gland ducts by the mites, resulting in reduced sebum secretion.

Despite ongoing debate regarding the pathogenic potential of *Demodex* species, various skin disorders have been reported in association with *Demodex* infestation, and alterations in the immune system are believed to play a role in the development of its pathogenic state. *Acne vulgaris*, *rosacea*, and *seborrheic dermatitis* are the main dermatological conditions in which this mite is thought to play a role in causing or exacerbation. Therefore, the diagnosis of demodicosis is

important for the appropriate treatment of skin disorders (3, 8). In the present study, 46.5% of *Demodex*-positive individuals presented with concurrent acne or pustular skin lesions. Forton and Seys, in their clinical investigation, concluded that the frequency of *Demodex* infestation was considerably higher among patients presenting with skin and hair lesions in dermatology clinics compared to healthy individuals (31). Similarly, Moravvej et al. reported a significantly higher prevalence of *Demodex* mites in patients with acne rosacea (38.6%) compared to the control group (11). In a study conducted by Mohammadhedayati et al. among women in Ardabil, the prevalence of *Demodex* infestation in individuals with skin lesions (44%) was markedly higher than in healthy subjects (20%), and statistical analysis confirmed a significant association between *Demodex* infestation and the presence of cutaneous lesions (32). Therefore, the findings of the present study are consistent with those of previous research.

In some studies, researchers have reported a reduction in the prevalence of *Demodex* infestation following improvements in personal hygiene practices. In the present study, a significant association was observed between the rate of *Demodex* infestation and factors such as frequency of face washing, use of cleansing agents, and sharing of personal hygiene items. These findings were consistent with the results of several previous studies (33, 34).

To reduce the probability of *Demodex* spp. reproduction, the following control methods are recommended: Washing the face twice a day with a non-soap cleanser, abstaining from oily cleansers and greasy makeup, and exfoliating the face periodically to remove dead skin cells. Human demodicosis can be provisionally controlled with topical insecticidal creams, including crotamiton 10%, permethrin 5%, as well as with systemic or topical metronidazole. In severe cases, like those with HIV infection, oral ivermectin can be advised (6). Tea tree oil has been generally applied as topical therapy for human demodicosis. However, this agent is not miticidal below a dose of 50%. This dose of tea tree oil may be irritating. The most miticidal ingredient of tea tree oil, terpinen-4-ol, is available in commercial formulations such as Cliradex®. Once or twice applications of ivermectin 1% cream are very effective in eliminating or reducing the particular sleeves in connection with *Demodex*-induced blepharitis (35).

The limitations of this study are: (A) Because the volunteers were selected only from those referred to the East Ahvaz Comprehensive Health Center, the results of this study in Ahvaz County may not be representative of all parts of Iran or even Ahvaz; (B) The results of this study may be affected by unobserved confounding factors that require further investigation; (C) Sampling was obtained only from face skin, and other skin areas were not investigated and compared for *Demodex* mite presence; (D) Another limitation of the study was that it did not include people under the age of twenty.

### 5.1. Conclusions

*Demodex* infestation can cause ophthalmological and dermatological problems. This is the first research into prevalence and the relationship between risk factors and human *Demodex* in Ahvaz City. In this aspect, it will be useful to conduct more studies on demodicosis. This study indicated a higher prevalence of *Demodex* in men and people with oily skin. The prevalence and severity of *Demodex* spp. infestation was also significantly higher in people with acne than in healthy people. The CTP method is a convenient and easy method for conducting epidemiological studies.

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### Footnotes

**AI Use Disclosure:** The authors declare that no generative AI tools were used in the creation of this article.

**Authors' Contribution:** H. K. designed and supervised the project. A. A. G. conducted the completion and data extraction from the questionnaire. H. K. and A. A. G. prepared the questionnaire. H. K. and A. A. G. took skin samples, prepared them, and identified the mites. M. D.

guided the sampling and performed statistical analysis. H. K. and A. K. wrote, edited and revised the manuscript.

**Conflict of Interests Statement:** The authors declare no competing interests.

**Data Availability:** No datasets were generated or analyzed during the current study.

**Ethical Approval:** This study was approved and registered by the Ethics Committee of Research at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. The study was conducted after obtaining permission from the Research Ethics Committee of the University (IR.AJUMS.REC.1401.075) on 2022/May/30.

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## References

- van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*. 2010;84(2):523-38. [PubMed ID: 20585380]. [PubMed Central ID: PMC2883932]. <https://doi.org/10.1007/s11192-009-0146-3>.
- Thoennes MS, Fergus DJ, Urban J, Trautwein M, Dunn RR. Ubiquity and diversity of human-associated Demodex mites. *PLoS One*. 2014;9(8). e106265. [PubMed ID: 25162399]. [PubMed Central ID: PMC4146604]. <https://doi.org/10.1371/journal.pone.0106265>.
- Lacey N, Kavanagh K, Tseng SC. Under the lash: Demodex mites in human diseases. *Biochem (Lond)*. 2009;31(4):2-6. [PubMed ID: 20664811]. [PubMed Central ID: PMC2906820].
- Zeytun E, Tilki E, Dogan S, Mumcuoglu 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(7):762-6. [PubMed ID: 28369843]. <https://doi.org/10.1111/ijd.13600>.
- Elston DM. Demodex mites: facts and controversies. *Clin Dermatol*. 2010;28(5):502-4. [PubMed ID: 20797509]. <https://doi.org/10.1016/j.cldermatol.2010.03.006>.
- Rather PA, Hassan I. Human demodex mite: the versatile mite of dermatological importance. *Indian J Dermatol*. 2014;59(1):60-6. [PubMed ID: 24470662]. [PubMed Central ID: PMC3884930]. <https://doi.org/10.4103/0019-5154.123498>.
- Yildiz R, Afsar M, Elasan S. Global Trends in Studies on the Presence of Demodex spp. in Patients Diagnosed with Blepharitis. *J Arthropod Borne Dis*. 2024;18(2):84-93. [PubMed ID: 39850258]. [PubMed Central ID: PMC11752671]. <https://doi.org/10.18502/jad.v18i2.17531>.
- Litwin D, WenChieh CHEN, Dzika E, Korycińska J. Human permanent ectoparasites; recent advances on biology and clinical significance of demodex mites: narrative review article. *Iranian journal of parasitology*. 2017;12(1):12.
- Dong H, Duncan LD. Cytologic findings in Demodex folliculitis: a case report and review of the literature. *Diagn Cytopathol*. 2006;34(3):232-4. [PubMed ID: 16548003]. <https://doi.org/10.1002/dc.20426>.
- Akilov OE, Butov YS, Mumcuoglu KY. A clinico-pathological approach to the classification of human demodicosis. *J Dtsch Dermatol Ges*. 2005;3(8):607-14. [PubMed ID: 16033479]. <https://doi.org/10.1111/j.1610-0387.2005.05725.x>.
- Moravvej H, Dehghan-Mangabadi M, Abbasian M, Meshkat-Razavi G. Association of rosacea with demodicosis. *Arch Iran Med*. 2007;10(2):199-203.
- Del Rosso JQ. Update on rosacea pathogenesis and correlation with medical therapeutic agents. *CUTIS-NEW YORK*. 2006;78(2):97.
- Goldsmith LA, Fitzpatrick TB, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, et al. Fitzpatrick's dermatology in general medicine. (No Title). 2012.
- Forton FMN, De Maertelaer V. Which factors influence Demodex proliferation? A retrospective pilot study highlighting a possible role of subtle immune variations and sebaceous gland status. *J Dermatol*. 2021;48(8):1210-20. [PubMed ID: 33969532]. <https://doi.org/10.1111/j346-8138.15910>.
- 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(12):998-1007. [PubMed ID: 22135149]. [PubMed Central ID: PMC3232433]. <https://doi.org/10.1631/jzus.B1100079>.
- Hosseini K, Bourque LB, Hays RD. Development and evaluation of a measure of patient-reported symptoms of Blepharitis. *Health Qual Life Outcomes*. 2018;16(1):11. [PubMed ID: 29325546]. [PubMed Central ID: PMC5765649]. <https://doi.org/10.1186/s12955-018-0839-5>.
- Rusiecka-Ziółkowska J, Nokiel M, Fleischer M. Demodex—an old pathogen or a new one? *Adv Clin Exp Med*. 2014;23(2):295-8. [PubMed ID: 24913122]. <https://doi.org/10.17219/academ/37081>.
- Stevenson K. Expert opinion and review article: The timing of comedone extraction in the treatment of premenstrual acne—a proposed therapeutic approach. *Int J Cosmet Sci*. 2011;33(2):99-104. [PubMed ID: 20807258]. <https://doi.org/10.1111/j.1468-2494.2010.00610.x>.
- Rahimi MT, Youssefi MR, Ahmadpour E. Prevalence of demodicosis among youth in Northern Iran. *Journal of Zoonotic Diseases*. 2016;1(1):54-7.
- Ding Y, Huang X. [Investigation of external auditory meatus secretion demodex folliculorum and demodex brevis infection in college students]. *Lin Chuang Er Bi Yan Hou Ke Za Zhi*. 2005;19(4):176-7. ZH. [PubMed ID: 15938214].
- Akbulatova LKh. [Demodicosis in Man]. *Vestn Dermatol Venerol*. 1964;38:34-42. [PubMed ID: 14183906].
- Walker AR. *Arthropods of humans and domestic animals: a guide to preliminary identification*. Springer Science & Business Media; 1994.
- Zhao YE, Peng Y, Wang XL, Wu LP, Wang M, Yan HL, et al. Facial dermatosis associated with Demodex: a case-control study. *J Zhejiang Univ Sci B*. 2011;12(12):1008-15. [PubMed ID: 22135150]. [PubMed Central ID: PMC3232434]. <https://doi.org/10.1631/jzus.B1100179>.
- Shokrani H, Nabavi R, Sarabi ZA. Demodicosis and Associated Risk Factors in Young Adults in Khorramabad. 2015. *Journal of Arak University of Medical Sciences*. 2016;19(3):38-45.
- Tilki E, Zeytun E, Dogan S. Prevalence and Density of Demodex folliculorum and Demodex brevis (Acari: Demodicidae) in Erzincan Province. *Turkiye Parazitol Derg*. 2017;41(2):80-6. [PubMed ID: 28695830]. <https://doi.org/10.5152/tpd.2017.5156>.

26. Yazisiz H, Cekin Y, Koclar FG. The Presence of Demodex Mites in Patients with Dermatologic Symptoms of the Face. *Turkiye Parazitol Derg*. 2019;43(3):143-8. [PubMed ID: 31502805]. <https://doi.org/10.4274/tpd.galenos.2019.6062>.

27. Czepita D, Kuzna-Grygiel W, Kosik-Bogacka D. [Investigations on the occurrence as well as the role of Demodex folliculorum and Demodex brevis in the pathogenesis of blepharitis]. *Klin Oczna*. 2005;107(1-3):80-2. [PubMed ID: 16052809].

28. Bonnar E, Eustace P, Powell FC. Demodex mite in normal skin. *Lancet*. 1991;337(8750):1168. [PubMed ID: 1674048]. [https://doi.org/10.1016/0140-6736\(91\)92841-0](https://doi.org/10.1016/0140-6736(91)92841-0).

29. Aycan OM, Otlu GH, Karaman U, Daldal N, Atambay M. [Frequency of the appearance of Demodex sp. in various patient and age groups]. *Turkiye Parazitol Derg*. 2007;31(2):115-8. [PubMed ID: 17594651].

30. Chudzicka-Strugala I, Golebiewska I, Brudecki G, Elamin W, Zwozdziak B. Demodicosis in Different Age Groups and Alternative Treatment Options-A Review. *J Clin Med*. 2023;12(4). [PubMed ID: 36836184]. [PubMed Central ID: PMC9961532]. <https://doi.org/10.3390/jcm12041649>.

31. Forton F, Seys B. Density of Demodex folliculorum in rosacea: a case-control study using standardized skin-surface biopsy. *Br J Dermatol*. 1993;128(6):650-9. [PubMed ID: 8338749]. <https://doi.org/10.1111/j.1365-2133.1993.tb00261.x>.

32. Mohammadhedayati F, Ahady M, Manouchehri S. Identification of demodex ectoparasite and its association with facial skin lesions among in women. *J Cosmet Dermatol*. 2019;10(2):94-100.

33. Okyay P, Ertabaklar H, Savk E, Erfug S. Prevalence of Demodex folliculorum in young adults: relation with sociodemographic/hygienic factors and acne vulgaris. *J Eur Acad Dermatol Venereol*. 2006;20(4):474-6. [PubMed ID: 16643160]. <https://doi.org/10.1111/j.1468-3083.2006.01470.x>.

34. Andrews JR. The prevalence of hair follicle mites in Caucasian New Zealanders. *The New Zealand medical journal*. 1982;95(711):451-3.

35. Helm CJ. Treatment of ocular Demodex infestation with topical ivermectin cream. *Am J Ophthalmol Case Rep*. 2022;26:101551. [PubMed ID: 35509284]. [PubMed Central ID: PMC9058595]. <https://doi.org/10.1016/j.ajoc.2022.101551>.