



A Survey of Human Face Mites *Demodex* (Acari, Demodicidae) in Patients with Dermatological Symptoms in Baghdad, Iraq

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Abstract

Demodex spp. mites are external obligate parasites; they are transmitted between hosts through direct contact, and may induce several dermatological symptoms when found in large numbers. However, these symptoms may be similar to other commonly known diseases; this often leads dermatologists to neglect the pathogenic role of these mites. Therefore, a better diagnosis is recommended in order to avoid mistreatment. The aim of this study was to investigate the correlation between *Demodex* mites and dermatological diseases. Infestation rates in patients suffering from acne, rosacea, folliculitis, and psoriasis were compared with asymptomatic patients, along with the mites' relation to gender, age, personal hygiene, time of year, and residency. These mites were mainly found in patients with rosacea (66.67%) followed by acne (64.41%), while they were only observed in 48.15% of asymptomatic patients, 40.00% in folliculitis, and 0.00% in psoriasis. The statistical analysis showed a significant relationship between infestation and the previously mentioned dermatological diseases ($P < 0.01$). The infestation rates increased significantly with age, reaching 83.33% in patients above 60 years old, and especially during cold months with higher humidity rates. These mites were also more predominantly found in urban areas (56.10%), followed by rural areas (48.45%). However, there was no significant relationship according to gender or personal hygiene.

Keywords: Acne, Rosacea, Folliculitis, *Demode*, Demodicosis, Face Mites.

مسح لحم وجه الانسان *Demodex* (Araci, Demodicidae) في المرضى الذين يعانون من من أعراض جلدية في بغداد، العراق

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الخلاصة

تعد أنواع لحم الوجه *Demodex* من الطفيليات الاجبارية الخارجية، والتي تنتقل عن طريق الاتصال المباشر بين الأشخاص، وقد تحفز هذه الطفيليات ظهور اعراض جلدية عديدة عندما تتواجد بأعداد كبيرة. لكن بسبب تشابه هذه الأعراض مع بعض الامراض الشائعة الاخرى، غالباً ما يهمل دورها كعامل امراضي. لذلك،

فإن التشخيص الأنسب مهم لتجنب العلاج الخاطئ. في هذه الدراسة، تمت مقارنة معدلات الإصابة في كل من المرضى المصابين بحب الشباب، داء الوردية، التهاب الجريبات، وداء الصدفية، بعدد من الحالات الخالية من الأعراض، بالإضافة لدراسة علاقة هذه الطفيليات مع كل من الجنس والعمر والنظافة الشخصية وأوقات السنة ومكان الإقامة. كان الهدف من هذه الدراسة هو اكتشاف العلاقة بين حلم الوجه *Demodex* والأمراض الجلدية. تم ايجاد الحلم غالبية لدى المرضى المصابين بداء الوردية (66.67%)، يليها حب الشباب (64.41%)، بينما لوحظ الحلم بنسبة (48.15%) فقط لدى المرضى الذين كانوا لا يعانون من أي أعراض ظاهرة، و(40.00%) لدى مجموعة داء الجريبات، و(0.00%) لدى مجموعة الصدفية. التحليل الاحصائي للنتائج اظهر وجود علاقة بين نسبة اعداد الحلم والأمراض الجلدية السابقة ($P < 0.01$). لوحظ ايضا ان معدلات الاصابة كانت ترتفع بشكل طردي مع زيادة العمر حيث وصلت لنسبة (83.33%) لدى المرضى الذين زادت أعمارهم عن 60 عاماً، وخصوصاً خلال الأشهر الباردة ذات نسب الرطوبة العالية. وتم ايجاد الحلم أيضا في المناطق الحضرية بنسبة (56.10%)، تليها المناطق الريفية (48.45%). لكن لم يتم ايجاد علاقة احصائية بالنسبة لجنس المريض أو النظافة الشخصية.

1. Introduction

Demodex spp. mites are obligate universal ectoparasites found within the human pilosebaceous units, they feed on nutrients and dead cells from hair roots, and may damage cell walls [1]. *Demodex folliculorum* (Simon), 1842, lives inside hair follicles, while *Demodex brevis* Akbulatova, 1963, lives within the secretory ducts of sebaceous glands, along with the Meibomian glands [2]. These mites are unable to survive without a host for extended periods of time, thus they are known to be transmitted between hosts via direct contact. These mites were detected in almost all races and ages with an estimated colony of 1000 to 2000 mites on each human [3, 4]. Their infestation is believed to be in correlation with dermatological symptoms, but it is still unclear if their increased numbers are the cause or the result of the inflammation [5]. The mere presence of these mites is usually asymptomatic, however, symptoms may occur when the host suffers from immunosuppression [6], or when they are present in great densities within a small area of the skin [7]. Infestation of the skin (more than 5 mites/cm²) may be associated with symptoms such as itching, pustules, dryness, nodulocystic lesions, erythema, and inflammation [8]. Their movement within the skin pores may result in irritation combined with increased oil production, which could trigger a vicious cycle of sensitive skin in patients suffering from rosacea [9]. The optimal method for collecting and counting these mites so far is the repeated extraction using Standardized Surface Skin Biopsy (SSSB) from their habitat inside the pilosebaceous units and then examining them under microscope [10].

2. Materials and Methods

During the period from November 2018 to June 2019, clinical specimens were collected from 220 patients suffering from dermatological diseases. The selected patients comprised 86 males, and 134 females, within different age groups ranging from 10 to 70 years old, with both symptomatic and asymptomatic cases. All studied cases were diagnosed and confirmed by specialized experienced dermatologists, and were collected from different hospitals in Baghdad, Iraq; Al-Imamain Al-Kadhmain Medical City, Al-Yarmuk Teaching Hospital, Al-Amirat Private Hospital, Al-Shahid Al-Hakim General Hospital, Al-Karama Teaching Hospital, and a private clinic in Al-Kadhmya district, in addition to The Department of Biology/College of Science/University of Baghdad. Written informed consent was obtained from all patients, and their information was recorded in a questionnaire sheet.

The skin of patients was cleaned using a cotton pad soaked with alcohol. After it was allowed to dry, a drop of alpha-cyanoacrylate adhesive (super glue) was placed on a slide, spread into an area of 1 cm², then pressed onto the skin. After 1-2 min, the glass slide was gently removed [11].

Figure 1 presents the standard procedure for the Standardized Surface Skin Biopsy (SSSB).

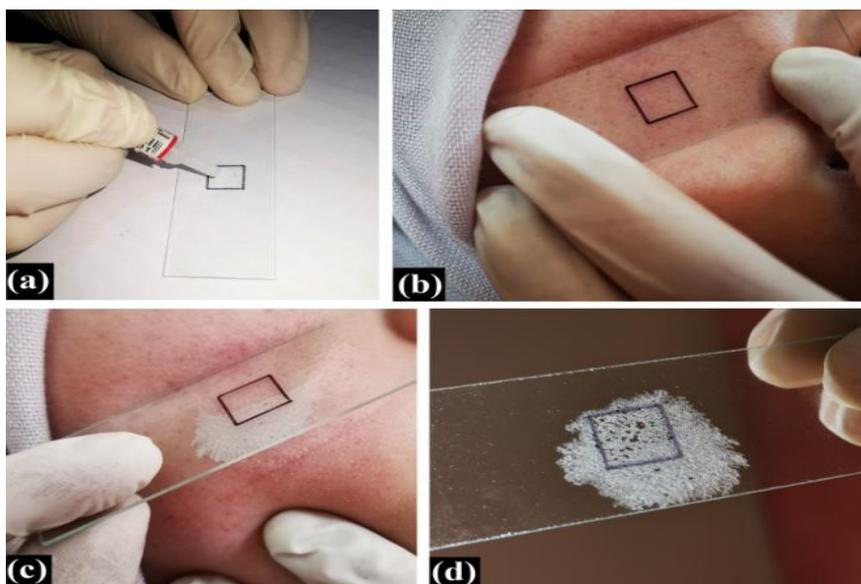


Figure 1-The standard procedure for the Standardized Surface Skin Biopsy (SSSB). An SSSB sample was collected from each patient, and the collected skin samples were then examined under microscope [11]. For each month, air temperature (T) and humidity (H) ranges in the city of Baghdad were recorded, as shown in Table 1.

Table 1 - The Temperature (T) and Humidity (H) ranges in Baghdad city, from November 2018 to June 2019.

Month	November	December	January	February	March	April	May	June
Temperature Range °C	10 - 30	6 - 22	-1 - 21	4 - 22	3 - 27	11 - 34	15 - 46	24 - 48
Humidity Range %	19 - 99	38 - 100	25 - 100	28 - 100	23 - 100	12 - 100	5 - 75	5 - 54

Sample examination

All collected specimens were examined immediately under compound light microscope (10× and 40× magnifications). A drop of normal saline was added to enhance the visibility of the mites. Different life stages of *Demodex* spp. were observed and classified based on phenotypic characteristics. The classification was confirmed by specialists in The Iraqi Natural History Museum and Research Center in the University of Baghdad, Baghdad, Iraq.

3. Results

The prevalence of *Demodex* spp. mites was observed in 232 patients, 81 were asymptomatic, 118 suffered from acne, 22 suffered from psoriasis, 6 suffered from rosacea, and 5 suffered from folliculitis. The statistical analysis of these results, based on the infestation rates in each case, showed that these mites were predominantly found in patients with rosacea (66.67%), followed immediately by acne (64.41%). However, these mites were not observed in any of the patients suffering from psoriasis, and were only seen in 48.15% of asymptomatic patients and 40.00% of patients with folliculitis. Also, a significant relationship was found when compared statistically ($P < 0.01$).

According to gender, these mites were present in females (55.22%) at a higher percentage than in males (47.67%). However, there was no significant difference when compared statistically.

In relation to age, these mites were consistently found in elderly patients in the age group of 61~70 (83.33%), followed by 51~60 (66.67%), 21~30 (61.47%), and 31~40 (59.46%). While it was rarely observed in young patients in the age groups of 10~20 (21.95%), followed by the

age 41~50 (33.33%). Significant statistical relationship was found between infestation rates and age ($P < 0.01$).

Based on hygiene of patients, it was noticed that the group with < 4 washes/day showed a slightly higher percentage (46.67%), while the ≥ 4 washes/day group showed a slightly lower percentage (41.00%). However, both percentages were too close and no significant relationship was found when compared statistically.

As for the mites' presence during the months of the year, these mites were mostly found in December (60.00%), followed by February (57.14%), June (57.14%), May (55.56%), November (51.92%), and January (50.00%). However, the lowest occurrence rates were recorded in March (44.12%), followed by April (44.44%), ($P < 0.05$), ($P < 0.01$).

In total, it was found in (52.73%) of dermatological infestations in Baghdad, Iraq. However, not all hospitals and districts were studied. Statistical analysis revealed that there was a significant relationship between the prevalence of *Demodex* mites in dermatological diseases with the variations in temperature ($P < 0.05$) and humidity ($P < 0.01$) specified by the different seasons.

Also, in relation to the type of residency, these mites were mostly found in urban areas (56.10%), followed by rural areas (48.45%). However, there was no significant relationship between infestation rates and residency when compared statistically.

Figure 2 presents the prevalence percentages of *Demodex* mites in skin according to dermatological diseases, personal hygiene, gender, residency, age, and their presence during the months of year, in Baghdad, Iraq.

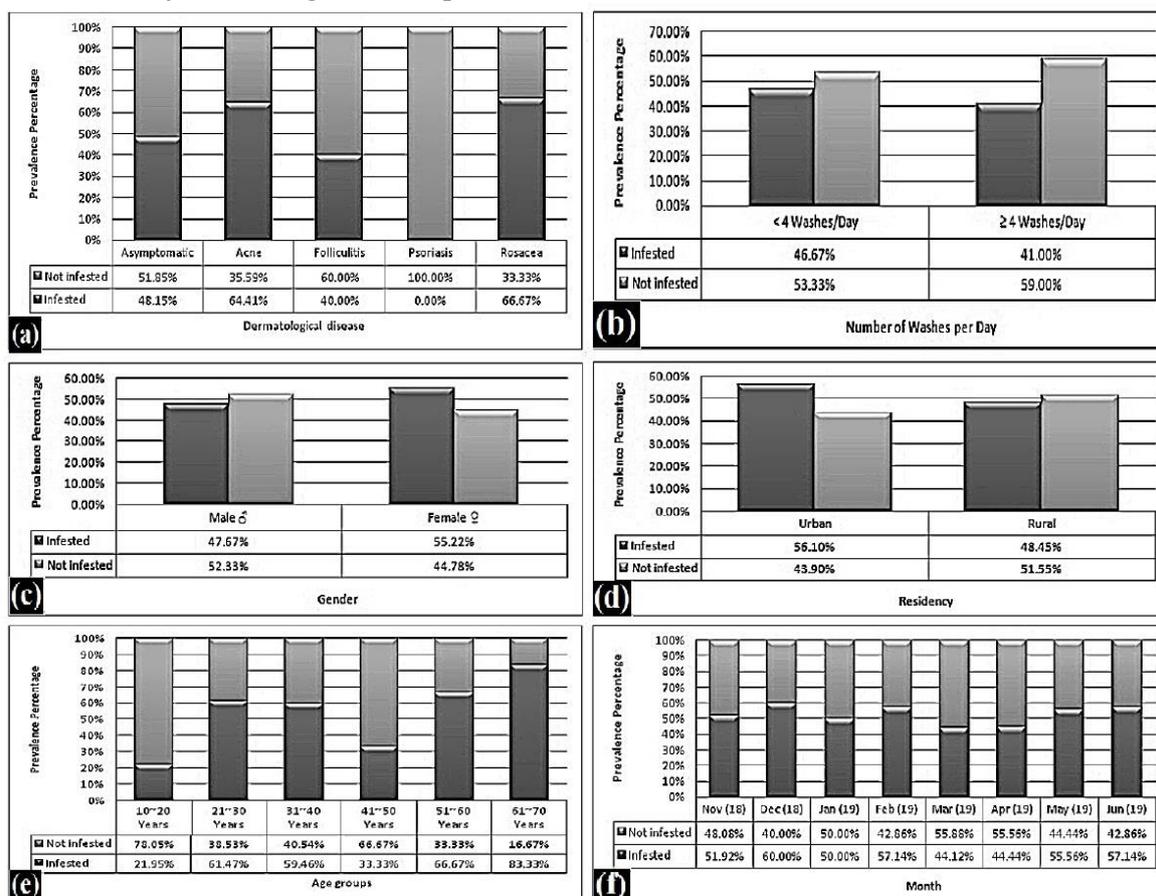


Figure 2-The relation between the prevalence Percentages of *Demodex* mites with: (a) Dermatological diseases, (b) Number of washes per day, (c) Gender, (d) Residency, (e) Age groups, (f) Month of year.

Figure 3 shows a case of demodicosis, along with *Demodex* mites inside the hair follicles of the skin, examined under microscope.

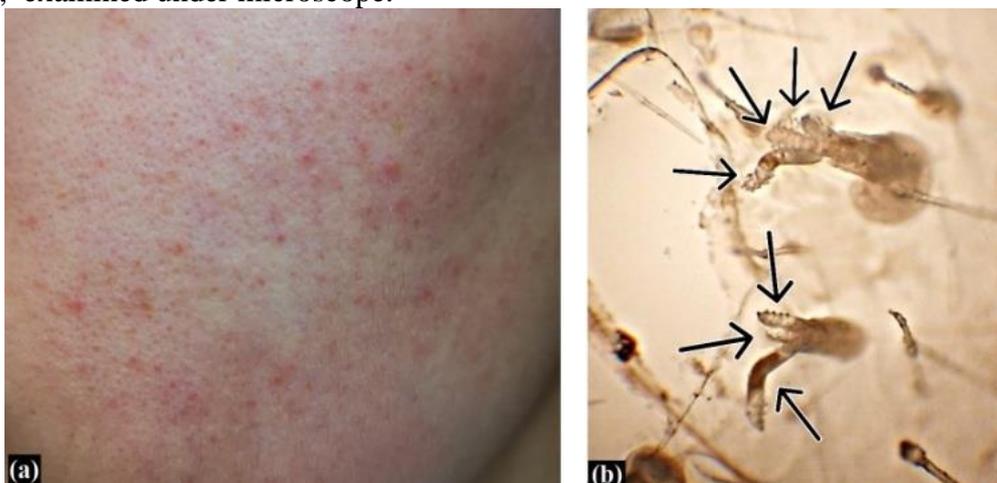


Figure 3-*Demodex* infestation in a dermatological case, (a) patient with demodicosis, (b) *Demodex* mites within the hair follicles as seen under microscope (10× magnification).

4. Discussion

Statistical analysis of the observed data revealed that there was a significant relationship between the presence of *Demodex* mites and the previously mentioned dermatological diseases (Rosacea, Acne and Folliculitis) ($P < 0.01$). These results are in agreement with the previously published studies, where *Demodex* mites were significantly found in patients with rosacea [9], acne-like demodicosis [12], and folliculitis [8]. However, this study is in disagreement with the outbreak of mites reported in patients with psoriasis [13], which may be due to the patients being undergoing different treatment methods other than phototherapy.

The relation between gender and *Demodex* infestation found in this study was also in agreement with previous studies where no significant correlation was found [9, 14]. However, some studies found a higher incidence rate in females [15]. These differences may be related to the health state, skin type, geography, or heredity of the individual patient, causing a fluctuation in the prevalence rates [16, 17], along with the difference in sebaceous gland morphology between genders and their sebum production rates [18].

Previous literature also confirmed the significant correlation between *Demodex* infestation and age [9, 14, 15]. This increase may be explained by the fact that elderly tissues contain mature follicles and glands that are fully developed, which in turn may provide the mites with the required nutrition [9], along with the fact that they are relatively immuno-compromised [5, 19]. On the other hand, it is important to point out the noticeable low prevalence rates in the age group of 41~50 years, along with the low rates found in the 10~20 years group. This may indicate that *Demodex* prevalence could be affected by the hormonal changes. Patients in these groups are either undergoing puberty or menopause, meaning that estrogen and androgen levels are fluctuating, which are known to target the sebaceous glands and control their size and sebum secretion [20, 21].

Personal hygiene was found to have no significant relationship with infestation rates. This agrees with previously published studies [9, 14, 22], despite the common belief where bad hygiene was considered suitable for the infestation of these mites. However, few studies suggested that *Demodex* prevalence was higher in patients with a low level of personal hygiene [23, 24]. This disagreement of findings may be explained by the fact that the majority of the studied patients washed their faces with water only and did not use soap in all washes, which may not have cleaned the face efficiently from excess oils and mites.

The relationship between the mites' infestation rates and time of year may indicate that the mites are positively affected by low temperatures and high humidity, and may be predominantly found during winter in Iraq; this is in agreement with previous literature conducted on laboratory cultures [14, 25]. However, it is recommended to study the changes of humidity and pH of the skin and their effects on the mites.

Previous studies on the relationship between *Demodex* prevalence and location of residency are relatively scarce; however, the results of this study are in agreement with few previous studies where no significant difference was found between types of residency [14, 22, 26]; however, it is in disagreement with studies that reported higher rates in rural areas [15]. Perhaps this difference in findings is due to the fact that patients in urban areas are more likely to use artificial lipids and cosmetics, which may have had an effect on the prevalence rates of these mites when compared to rural areas. In addition, it could be affected by the differences in the environment, biotic, and abiotic factors within both areas [5].

5. References

- [1] Spickett, S., "Studies on *Demodex folliculorum* simon (1842). I. Life history", *Parasitology*, vol. 51, no. 1-2, pp. 181-192, 1961.
- [2] Yun, C. H., Yun, J. H., Baek, J. O., Roh, J. Y., and Lee, J. R., "*Demodex* mite density determinations by standardized skin surface biopsy and direct microscopic examination and their relations with clinical types and distribution patterns", *Ann. Dermatol.*, vol. 29, no. 2, pp. 137-142, 2017.
- [3] Bharucha, H., "Diagnostic pathology of parasitic infections with clinical correlations (2nd edn). Yezid gutierrez, md, mph&tm, phd. Oxford university press, new york, 2000", *J. Pathol.*, vol. 193, no. 2, pp. 277-277, 2001.
- [4] Chen, W. and Plewig, G., "Human demodicosis: Revisit and a proposed classification", *Br. J. Dermatol.*, vol. 170, no. 6, pp. 1219-1225, 2014.
- [5] Zhong, J., Tan, Y., Li, S., Peng, L., Wang, B., Deng, Y., and Yuan, J., "The prevalence of *Demodex folliculorum* and *Demodex brevis* in cylindrical dandruff patients", *Journal of ophthalmology*, vol. 2019, no., pp. 1-7, 2019.
- [6] Martins, G. and Miteva, M., "Chapter 20 - hair and scalp infections, in *Alopecia*: Elsevier, 2019, p. 207-218.
- [7] Rather, P. A. and Hassan, I., "Human *Demodex* mite: The versatile mite of dermatological importance", *Indian J. Dermatol.*, vol. 59, no. 1, pp. 60-66, 2014.
- [8] Bachmeyer, C. and Moreno-Sabater, A., "*Demodex* folliculitis", *CMAJ*, vol. 189, no. 25, pp. 865, 2017.
- [9] Durmaz, S., Erkan, Y., Kaya, O. A., Gokmen, A. A., Kilinc, C., Atambay, M., Ozlem, E., Bag, H. G., and Pektas, B., "Sociodemographic characteristics of patients with *Demodex brevis* and *Demodex folliculorum* infestation and its association with rosacea and beçet's disease", *Biomedical Research*, vol. 26, no. 3, pp. 549-555, 2015.
- [10] Lacey, N., Russell-Hallinan, A., and Powell, F. C., "Study of *Demodex* mites: Challenges and solutions", *J. Eur. Acad. Dermatol. Venereol.*, vol. 30, no. 5, pp. 764-775, 2016.
- [11] Askin, U. and Seckin, D., "Comparison of the two techniques for measurement of the density of *Demodex folliculorum*: Standardized skin surface biopsy and direct microscopic examination", *Br J Dermatol*, vol. 162, no. 5, pp. 1124-1126, 2010.
- [12] Sarangua, T. S., Gurbadam, A., and Enkhtur, Y. A., "Correlation *Demodex folliculorum* and skin biophysical parameters", *JCDSA*, vol. 3, no. 03, pp. 222, 2013.
- [13] Zirbs, M., Mourantchian, V., Radopoulou, E., Gutermuth, J., Andres, C., Ring, J., and Brockow, K., "Demodicidosis associated with psoriasis therapy—two case reports", *Australas. J. Dermatol.*, vol. 54, no. 3, pp. 235-236, 2013.
- [14] Bedair, B. H. and Salman, S. D., "Survey of human face mites *Demodex owen*, 1843 (acari, demodicidae) in patients with blepharitis and chalazia in Iraq", *IJS*, vol. 62, no. 1, pp. 39-44, 2021.

- [15] Cui, J. H. and Wang, C., "Facial *Demodex* infestation among urban and rural residents in Shangqiu city of Henan province", *Chinese Journal of Parasitology & Parasitic Diseases*, vol. 30, no. 4, pp. 283-285, 2012.
- [16] Palopoli, M. F., Fergus, D. J., Minot, S., Pei, D. T., Simison, W. B., Fernandez-Silva, I., Thoemmes, M. S., Dunn, R. R., and Trautwein, M., "Global divergence of the human follicle mite *Demodex folliculorum*: Persistent associations between host ancestry and mite lineages", *Proc. Natl. Acad. Sci. U. S. A.*, vol. 112, no. 52, pp. 15958-15963, 2015.
- [17] Thoemmes, M. S., Fergus, D. J., Urban, J., Trautwein, M., and Dunn, R. R., "Ubiquity and diversity of human-associated *Demodex* mites", *PLoS One*, vol. 9, no. 8, pp. 106265, 2014.
- [18] Sugawara, T., Nakagawa, N., Shimizu, N., Hirai, N., Saijo, Y., and Sakai, S., "Gender- and age-related differences in facial sebaceous glands in asian skin, as observed by non-invasive analysis using three-dimensional ultrasound microscopy", *Skin Res Technol*, vol. 25, no. 3, pp. 347-354, 2019.
- [19] Lacey, N., Ni Raghallaigh, S., and Powell, F. C., "*Demodex* mites-commensals, parasites or mutualistic organisms?", *Dermatology*, vol. 222, no. 2, pp. 128-130, 2011.
- [20] Khurana, I. and Khurana, A., "*Concise textbook of human physiology*": Elsevier Health Sciences, 2018.
- [21] Hall, J. E. and Guyton, A. C., "*Guyton and hall textbook of medical physiology 12th ed.*": Elsevier Health Sciences, 2010, p. 925-1080.
- [22] Zhao, Y. E., Guo, N., Xun, M., Xu, J. R., Wang, M., and Wang, D. L., "Sociodemographic characteristics and risk factor analysis of *Demodex* infestation (acari: Demodicidae)", *J. Zhejiang Univ. Sci. B.*, vol. 12, no. 12, pp. 998-1007, 2011b.
- [23] Zeytun, E., "*Demodex* (acari: Demodicidae) infestation in the elderly and its relationship with the skin parameters such as moisture, pH, and temperature: A cross sectional study", *Turk. Geriatri. Dergisi.*, vol. 20, no., pp. 142-150, 2017.
- [24] Forton, F., Germaux, M. A., Brasseur, T., De Liever, A., Laporte, M., Mathys, C., Sass, U., Stene, J. J., Thibaut, S., Tytgat, M., and Seys, B., "Demodicosis and rosacea: Epidemiology and significance in daily dermatologic practice", *J. Am. Acad. Dermatol.*, vol. 52, no. 1, pp. 74-87, 2005.
- [25] Zhao, Y. E., Guo, N., and Wu, L. P., "Influence of temperature and medium on viability of *Demodex folliculorum* and *Demodex brevis* (acari: Demodicidae)", *Exp. Appl. Acarol.*, vol. 54, no. 4, pp. 421-425, 2011a.
- [26] Chudzicka-Strugała, I., Mądry, I. J., Malesza, M., Kwan, A. L., Winardi, W., Piotrowska-Brudnicka, S., Mądry, R., Walkowiak, J., and Mądry, E., "*Demodex* mite infections in ophthalmic patients on Indonesian islands: The ics humanitarian aid report", *Int. Surg.*, vol. 103, no. 3, pp. 122-128, 2018.