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Original Article

Dermatoparasitoses in Referral Patients to the Laboratory

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Abstract

Background: Dermatoparasitic infestations due to the mites *Demodex* spp. and *Sarcoptes scabie* are prevalent dermatological disorders worldwide.

Methods: Referral patients from the Departments of Dermatology, Infectious Diseases, and from the psychologists, in some cases, to the laboratory of Medical Helminthology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran were examined and documented for demodicosis and scabies from March 2009 to December 2020. All patients' data were collected and then analyzed statistically by SDATA version 14, using the Chi-square test.

Results: Out of 494-suspected patients suffering from dermal disorders, 99 patients (20.04%) and 20 cases (4.04%) were found infested with demodicosis and scabies, respectively. Most demodicosis cases belonged to the 46-60 year age group while the infestation rate of scabies was higher in the age group under 5 years (P=<0.0001). Demodicosis was seen more prevalent in women than men, and scabies were higher in men (P=0.15). The cases of demodicosis in fall and scabies in winter and spring were more frequent. Demodicosis picked up in 2015 and 2017 (P=0.03), while the prevalent year for scabies was in 2016 (P=0.77). Both current ectoparasites declined dramatically by Covid-19 pandemic.

Conclusion: Demodicosis and scabies have been found correlated with age, and no statistical association was seen between the gender and seasonal factors. Besides, the obvious decline of demodicosis and scabies infestation rates during the Covid-19 outbreak can mention that social distance and hygiene standards have negative effects on dermatoparasites transmission.

Introduction

Humans' infestations by ectoparasites such as head lice, ticks and mites belonging to Arthropod species that normally live on or inside their host skin, are often assumed as a problem in less developed countries (1). About 80% - 90% of people during their life are afflicted by *Demodex*, mostly reported in females (2). *D. folliculorum* and *D. brevis* live within hair follicles and skin sebaceous gland respectively, are 2 main species that have been found in human skin (3). *Demodex* spp. with a density of < 5 D/cm^2 is a saprophyte agent. When the host skin is a suitable microenvironment, transforming them into a pathogenic phase will be facilitated (4).

Pityriasis folliculorum (5) papulopustular rosacea (PPR) (6), granulomatous rosacea (7), inflammatory papule (8), folliculitis (9), hyperpigmentation (10) and blepharitis (11) are skin disorders associated with *Demodex* mites activity (12). Significant severe forms of rosacea can manifest atypical conditions making persistent skin lesions. Sometimes in heavy infestation, there is no clear distinction between a pathognomonic butterfly rash of Lupus erythematosus and demodicosis (13).

As *Demodex* mites commonly show tolerance with most antiseptic agents, such as 75% alcohol, 10% povidone-iodine, as well as erythromycin, documented experiences suggest using tea tree oil products as an effective treatment in chronic demodicosis (14-18).

Sarcoptes scabei var. *hominis* is an obligate mite causing human scabies, transmitted in close skin-to-skin or sexual contact (19). Scabies has been recorded highly in island countries of the Pacific with a higher rate in children. Besides, Panama, parts of Brazil, and indigenous communities of northern Australia are known as regions with a high burden scabies in the human population (20). Hospitals, nursing homes, prisons, or kindergartens are known as high-risk places for contamination where outbreaks of *S. scabiei* could be frequently experienced by residents (21). A study in the central prison of Hamadan city in Iran in 2013 showed that 2.6% of prisoners had scabies (22). The prevalence of scabies in Ghezel Hesar prison in Karaj and in Kerman central prison was also estimated at 2.2 and 1.2%, respectively (23, 24). Scabies was diagnosed in 57% of prisoners complaining of skin disorders in Bandar Abbas prison in Hormozgan (25). A descriptive study conducted in the Khorasan Province of Iran, recorded 18.7% of scabies contamination (26). In the patterns of skin diseases in Hormozgan, scabies was introduced as a frequent recurrent skin infection in his region (27). Scabies is more prevalent in humid regions of Iran, and the prevalence of scabies is the highest in (Hormozgan, Golestan, Mazandaran, and Gilan) with an incidence rate of 1 to 5 cases per 1000 people (28, 29).

Generalized itchy symptoms originates from a hypersensitivity reaction to mite antigens, which exacerbates at night, leading to sleeplessness of patients spoiling the quality of their life (30).

This retrospective descriptive study aimed to estimate the prevalence of ectoparasites (*D. scabies*) in dermatological patients referred to the Laboratory of Helminthology, Tehran University of Medical Sciences in Iran. We believe that regular monitoring of ectoparasites in different regions might help researchers for control and management of skin disorders.

Materials and Methods

Since the patients who were suspected of having other ectoparasites such as head lice and/or have been annoyed by bed bugs were referred to the Entomology Lab, we mainly focused on the cases of demodicosis and scabies referred to the Laboratory of Helmin-

thology. Demographic information (age, sex, date, and drug use), seasonal distribution, and the obtained skin test results of 494 patients who were suspected of demodicosis and scabies with skin symptoms such as itching, redness, and allergic inflammation referred to the Laboratory of Helminthology, School of Public Health, Tehran University of Medical Sciences, Iran were recorded during March 2009 to December 2020. The studied samples were received from dermatological, neuropsychological, and pathological clinics.

The information recorded during these 12 years was collected and imported into an excel file analyzed by SDATA version 14, using the Chi-square test. *P* value less than 0.05 was considered significant.

Sampling

Dermal scraping was the practical method of choice used in our laboratory. Along with routine skin sampling, the non-invasive scotch tape test was also applied for young children and those with sensitive skin. To achieve a reliable sample, scalpel blades for skin scraping were used for cases with skin lesions. Samples become transparent enough in lacto phenol solution for further microscopic detection. Direct parasitological identification was implemented, then photography did by a camera-equipped microscope for each. The patients have been referred to the laboratory of Medical Helminthology by authorized physicians from the Medical Council of Iran. *Sarcoptes scabiei* (Fig. 1).

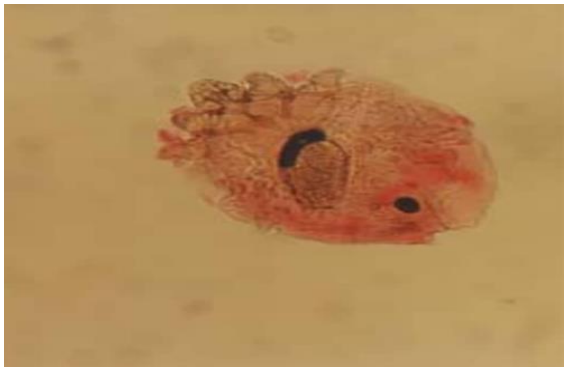

Fig. 1: Scraping containing. *Sarcoptes scabiei* (10X)

Demodex spp. (Fig. 2). *Demodex* spp. (Fig.3) are of sampling specimens kept in the archive of the late Dr. Iraj Mobedi.

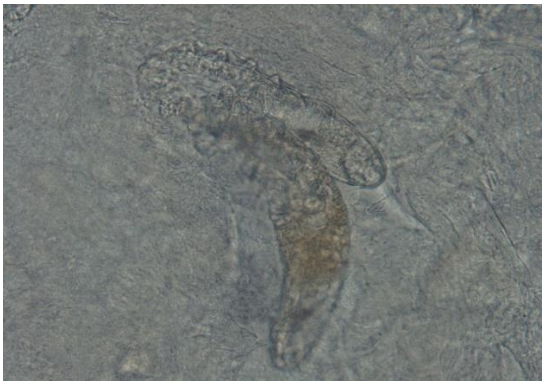

Fig. 2: Scraping containing *Demodex* mites (40X)

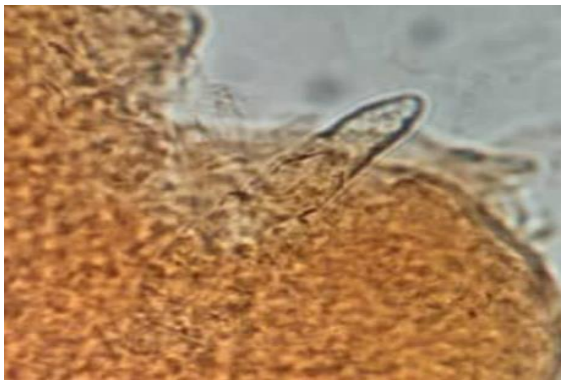

Fig. 3: Scraping containing *Demodex* mites (40X)

Results

Out of 494 submitted patients (280 females and 214 males) 119 cases (24.08%) were infested by at least one ectoparasite. *Demodex* spp. and *S. scabiei* were causative agents in 99 (20.04%) and 20 cases (4.04%), respectively. As shown in Table 1, the cases were in different age groups ranging from 2 months to the oldest about 83 years old. Demodicosis was observed more prevalent in women than men, and scabies was highest in men. Mos*t Demodex* infestation rates were among the 46-60 years age group. Most scabies infestation rate belongs to the under 5-year age group. There is a

significant correlation between infestation rate and age (P < 0.0001). There is no significant association between infestation rate and gender (P= 0.150) (Table 1).

Table 1: Result of demodicosis and scabies final diagnosis based on age and gender

Group	*Description*	*Frequency*	*Proportion (%)*	*Scabies Infestation Rate (%)*	*Demodicosis Infestation Rate (%)*	*P-value*
Age	<5	23	4.74	5/23 (21.73)	1/23(4.34)	<0.0001
(yr)	5-15	27	5.56	1/27 (3.70)	3/27(11.11)	
	16-30	120	24.74	7/120 (5.83)	20/120(16.66)	
	31-45	144	29.69	4/144 (2.77)	26/144(18.05)	
	46-60	107	22.06	0	32/107(29.90)	
	>60	64	13.19	3/64 (4.68)	17/64(26.56)	
Gender	Male	214	43.3	12/214(5.60)	42/214(19.62)	0.150
	Female	280	56.7	8/280(2.85)	57/280(20.3)	

Most patients with demodicosis (n=22) were observed in the years 2015 and 2017. Meanwhile, Scabies positive cases in 2016 were highest with five patients. Our study indicated a significant decline in the incidence of *Demodex* and *S. scabiei* mites after the Covid-19 pandemic. The prevalence of demodicosis was seen significantly correlated with the year (*P* =0.03). Scabies cases were highest in 2016 with no statistical significance (*P* =0.77) (Fig.4).

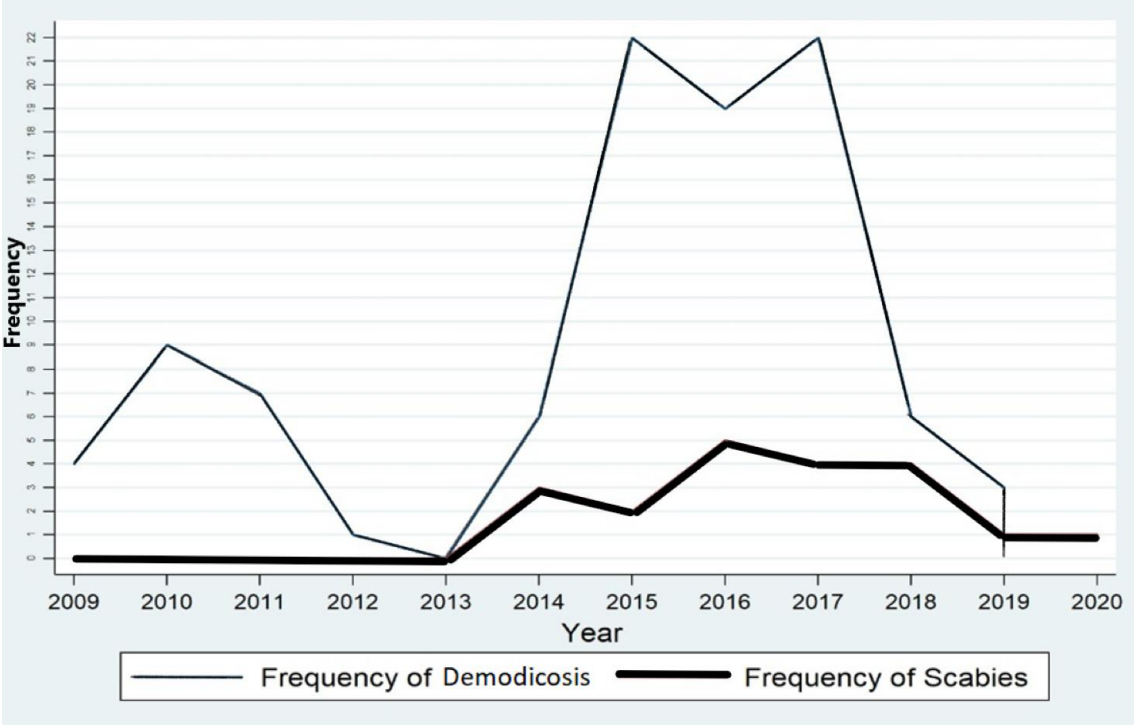

Fig.4: Linear graph of distribution demodicosis and scabies from 2009 to 2020

Nearly one-third of the demodicosis cases were diagnosed in autumn. However, the seasonal trend for scabies showed the highest rates in winter and spring and no statistically significant correlation have been observed between the prevalence of demodicosis and scabies infestation in different seasons (P >0.05).

Discussion

Here the occurrences of two medical important ectoparasites (*Demodex* spp. & *S. scabiei*) in the patients referred to our laboratory have been discussed. In general the (24.08%) of the total cases were seen as positive illustrating the status of ectoparasitoses in the studied period. Seasonal trends as well as age groups along with the distribution of two mentioned ectoparasites in different genders have also been regarded in this study. Similar works in neighboring countries and from remote geographical regions were, however, compared with the results that we did retrieve. As can conclude from our data, it was clearly shown that in the present analysis the incidence of demodicosis (20.04%) was predominantly higher comparing with scabies (4.04%).

In our study, demodicosis was higher in women than men with no significant statically association. In Iraq, on 220 people with skin disease, demodicosis was reported more in women than men. Nevertheless, there was no significant relationship between the prevalence of demodicosis and gender, which is similar to our study (31) and the study of Suleyman Durmaz et al in Turkey (32). It was rarely recorded that males showed more prevalence rate of infestation with *Demodex* spp. compared to females indicating the hypothesis of having androgenic hormones, like testosterone, stimulates the sebaceous glands in men facilitating mites proliferations (33). Different aspects have also been studied by researchers regarding demodicosis, like what has been done in Hungary examining the risk factor of cosmetic use in the prevalence of demodicosis (34). Accordingly, men were more likely to develop demodicosis than women. Their results were in contrast with our study and more other studies that mentioned before and reported demodicosis in women more common than in men. The use of cosmetics introduced a protective factor against demodicosis due to toxic compounds in these creams, and in addition, these substances prevent oxygen access to the parasite (34). In general, the obtained results indicate that gender is not counted as an important effective variant for demodicosis (35, 36).

In Iraq, the prevalence of demodicosis was obviously increased with age, showing the highest prevalence of demodicosis in 3.83% of people over 60 years of age (31). Similarly, the prevalence rate of demodicosis was increased with age reaching 77% at the age of over 70 years according to the Poland study (36). Regardless of the basic condition of the patients, the prevalence of *Demodex* spp. in metabolic syndrome cases in Turkey, was reported higher in the age group 40 to 49 years old that is more similar to our conclusion that 46- 60 age group significantly shows higher infestation rate in comparison with other age groups (2) .In a study conducted on 370 people in the United States, the prevalence of demodicosis was significantly increased in the age group of 51-90 (66.7%) among the 370 individuals (37).This study is consistent with many studies in terms of the enhanced prevalence of demodicosis with age (38-41). In another study on patients with posterior blepharitis, mites were detected as highly prevalent after the age of 50 compared with young age groups (42).

Seasonal factors have also been studied in the present work in which nearly one-third of the positive demodicosis (n=30) occurs in autumn (30/99). In Iraq, the prevalence of demodicosis in winter was higher than in other seasons (31). In South China in 2021, the incidence of eye infections due to *Demodex* spp. was significantly higher in autumn and winter than in other seasons amongst 1,575 school-

children (43). Apparently, there is consensus in the literature that *Demodex* spp. prefer cold weather. In China, a study of two *Demodex* species recorded a temperature of 16-20°C as the optimum temperature for the parasite to grow in vitro and claim that *Demodex* spp. more tolerate cold weather and survive longer in low temperature (44).

From the health points of view, poor sanitation in crowded regions will make the condition suitable to dispread these contagious agents, including scabies (45, 46). This is worth mentioning in the most crowded countries in the world like Bangladesh (47) with (90%) scabies infestation rate (48) followed by Thailand (87.3%) (49) and Sierra Leone (81.5%) have been recorded (46). In the present study, scabies in men exceeds women. Significantly, in children under 5 years old the highest rate compared to other age groups was seen, which is slightly similar to what has been conducted in Australia indicating the prevalence of the mites *S. scabiei* in children is higher than in adolescents and adults (50). The prevalence of scabies in Khorasan Province northeastern Iran was higher in men than women in 2014 and the age group of 10 to 19 years illustrated the highest incidence of scabies (26). Moreover, in Isfahan, Iran scabies was seen three times higher in men. Moreover, in this study, the prevalence of scabies in the age group of 15 to 39 years old was higher than in other age groups (28). Other studies were in agreement with our study and announced scabies prevalence was higher among the preschool and school age groups (51-54). In contrast, with so many previously published data, scabies in the U.K has been reported more prevalent in females than males, which could be presumably attributed to more concerns by females on medical issues leading to their more attendance to consult physician in this country (55).

Our data indicated that scabies in spring and winter is higher than in other seasons. The seasonal trend of scabies in South Korea indicated that by temperature increase from 5 °C to 25 °C, the number of patients who suffer from scabies gradually increased. They also stated that scabies outbreaks are correlated merely with the temperature with no seasonal associations and the optimum temperature at 14.5 °C was documented (56). In a long-term analysis of a large sample size, the British Dermatologists announced their findings showing a significantly higher rate of scabies in the cooler months of the year (57). It seems that reporting the highest outbreak in winter in some regions with a mean temperature about 14.5 °C and its autumn increasing prevalence in another geographical area with 7-15°C temperature sounds similar (58). The study conducted in Scotland shows the frequency of scabies higher in the first and third quarters of the year with no seasonal correlation (59).

Interestingly, in 2020 no positive demodicosis was recorded in our study. Moreover, scabies trend in this year manifests a significant decrease. Therefore, the Covid-19 pandemic situation might be attributed to this decline It is supposed that the current protocol used in preventing Covid-19 air-borne virus such as imposed social distancing and ventilation regulations might have been responsible for the recent reduction of ectoparasites such as mites. In this regard, the explosion of scabies cases in Turkey at the time of the Covid-19 pandemic compared with the past is in contrast with its trend in European countries and our present results. Turkey's lifestyle such as its large household number as well as their preferences to stay in rural areas during the Covid-19 pandemic might have caused the shoot-up of scabies incident in this country. Furthermore, and referring to this article, in European countries, hospitals have been mainly focused on Covid patients while the non-urgent cases, including the scabies patients, were neglected. This clinical policy, which was also pursued in Iran, might be led to overlooking the actual number of dermatological disorders (60, 61).

Conclusion

Demodicosis and scabies can be regarded as multifactorial disorders affected by sex, age, environmental conditions, and the patient's lifestyle. Besides, the apparent decline of demodicosis and scabies infestation rates during the Covid 19 outbreak can mention that social distance and hygiene standards improved in communities could be an obstacle to dermatoparasites transmission. The authors believe that taking advantage of a comprehensive and multidisciplinary approach could be a principal source of scientific information to diagnose the underlying cause of unknown skin disorders.

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Conflict of interest

The authors declare that there are no conflicts of interest.

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