Original Article

The Situation of Fungal and *Demodex* Infestation and Contributory Factors on Adult Acne

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Background: Recently, adult acne has increased with the infestation of fungal and *Demodex* due to use of poor quality cosmetic products.

Objective: To define the prevalence of fungal and *Demodex* infestation and its related factors on adult acne at Can Tho Dermatology Hospital, Vietnam.

Materials and Methods: A cross-sectional descriptive study on 134 adult acne patients at Can Tho Dermatology Hospital, Vietnam.

Results: The study from 8/2014 to 3/2015 recorded the prevalence of fungal and *Demodex* infestation on adult acne patients which were 29.1% (*Demodex* 26.1% and fungi 3%). Related factors were tingling sensation (p = 0.017, OR = 2.5), no papules or pustules (p = 0.016, OR = 0.362), lesions on the cheeks (p = 0.047, OR = 0.68), clinical characteristics (p = 0.002), dry skin and scaling (p<0.001, OR = 22).

Conclusion: The prevalence of fungal and *Demodex* infestation on adult acne patients was 29.1%. Adult acne patients with tingling feeling, dry skin and scaling, acne comedones and most of lesions on the cheeks had higher possibility of fungal and *Demodex* infestation.

Keywords: *Demodex*, Fungal, Adult acne

J Med Assoc Thai 2019;102(Suppl.7): 1-5
Website: http://www.jmatonline.com

Recent studies have shown a significant increase in the incidence of adult acne (age 25 and older)[1]. Factors related to the onset as well as the prolongation of adult acne are often referred to the habit of using cosmetics, drug-resistant bacteria, and hormonal disorders. However, clinically proven cases of adult acne not responding to conventional treatment have been associated with the appearance of pathogenic microorganisms such as *Demodex* and fungal infections; this is a matter of interest to scientists. In the world, recent years, there have been studies on the status of infection with *Demodex* in acne patients[2,3]. In Vietnam, a study in Hanoi, Vietnam of Huong Dang in 2005 revealed impressive number of *Demodex* infection of dermatitis patients who used topical corticosteroid to treat another skin disease before (64,8%)[4]. Another research in Danang, Vietnam, which can represent Central Vietnam, showed nearly a half of patients who used unknown cosmetics before had *Demodex* folliculitis[5]. Moreover, the habit of using topical drugs uncontrollably in the North of Vietnam was much more popular. Overall, in Vietnam so far, there had been very few studies showing the presence of parasites and fungi infection in adult acne patients, especially the relationship between this age and the habit of using cosmetics. But this was a very common practice and difficult to diagnose and treat.

Can Tho Dermatology Hospital is a specialized hospital in the Mekong Delta. The number of patients with acne had been increasing and the treatment was often difficult, especially the cases of acne that were associated with parasites. Therefore, the implementation of the topic was necessary. The topic aims at two objectives: (1) To define the prevalence of fungi and *Demodex* in adult acne patients at Can Tho Dermatology Hospital (DH) in 2014 to 2015; (2) To learn about some factors related to fungal infection and *Demodex* in adult acne patients at Can Tho Dermatology Hospital (Can Tho, Vietnam) in 2014 to 2015.

Materials and Methods

Subjects

Adult acne patients were 25 years old and over who came to Can Tho Dermatology Hospital from August 2014 to March 2015[1] for diagnosing and categorizing acne based on the standards about the lesions and distributed area. The lesions of acne included red papules, pustules, cysts and comedones. The distributed area consisted of face, neck, back

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How to cite this article: Tran HG, Huynh CB, Nguyen TT, Tran HD, Huynh BV. The Situation of Fungal and *Demodex* Infestation and Contributory Factors on Adult Acne. J Med Assoc Thai 2019;102(Suppl.7): 1-5.

and chest[6]. Following the previous study of Ba Van Huynh in 2009, the prevalence of acne patients who had *Demodex* and fungi infections was 8.36%[7]. Therefore, we chose 130 adult acne patients with reliability at 95%.

Methods

The present study was designed as cross-sectional descriptive and analytic. The authors collected the sample conveniently at Can Tho Dermatology Hospital from August 2014 to March 2015 following three steps:

(1) Interviews: Direct interviews with patients according to the prepared data collection form, which included age, gender, occupation, location, chief complaint, medical history, use of cosmetics, and some factors related to acne patients (e.g. habits, knowledge, …).

(2) Clinical examination: To define clinical characteristics included types of lesions, distributed area, severe levels. The acne severity levels based on the Hayashi study were categorized into 4 levels by the number of inflammatory lesions: 0 to 5 lesions (mild); 6 to 20 lesions (average); 21 to 50 lesions (severe); over 50 lesions (very severe)[8].

(3) Testing technique for *Demodex*: Skin pressurization method was employed in the process of *Demodex* examination. Then, the *Demodex* density was evaluated with 40x powerfield and classified as severe (≥5 mites/cm^2) and mild (1 to 4 mites/cm^2). Testing technique for fungi: direct microscopy with potassium hydroxide (KOH). The data collected were analyzed by using SPSS for windows version 18.0 software.

Results

The prevalence of Demodex and fungi in adult acne patients

Figure 1 revealed the prevalence of *Demodex* and fungi in adult acne patients was 29.1%. Specifically, there were 3% patients infected with *Candida albicans* and 26% patients infected with *Demodex*.

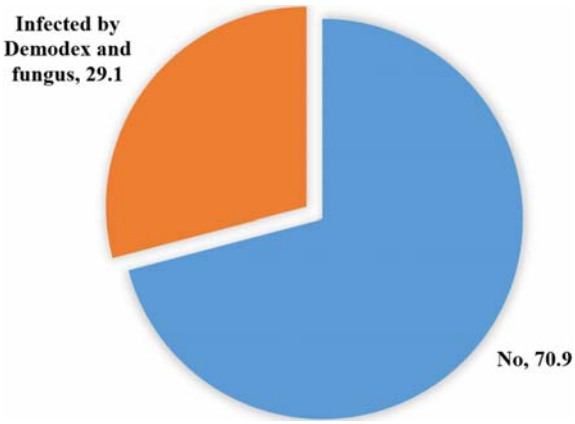

Figure 1. The general prevalence of *Demodex* and fungi.

Several related factors

The prevalence of *Demodex* and fungi in patients with tingling sensation was 41.7%, 2.5 times higher than those without feeling this (22.1%) as shown in Table 1. The difference was statistically significant (p<0.05). For a normal patient who had acne, tingling sensation was a strange feeling so this could draw attention to the clinicians to think about this infection.

The prevalence of *Demodex* and fungi in cases with inflammatory papules was 24%, lower than those without inflammatory papules (46.7%) as shown in Table 2. The prevalence of *Demodex* and fungi in cases with pustules was 15.5%, lower than those without pustules (39.5%). The difference was statistically significant (p<0.05). Therefore, the manifestation of acne adult patients seemed to be milder than other kind of acne patients.

The prevalence of *Demodex* and fungi mainly focused on the cheek compared to other locations on the face (31.2%) as shown in Table 3. The difference was statistically significant (p<0.05).

The prevalence of *Demodex* and fungi predominated in the group of patients with comedone (58.3%) as shown in Table 4. The difference was statistically significant (p<0.05).

Table 1. The relationship between tingling sensation and *Demodex*, fungal infection

Tingling sensation	*Demodex*, fungal infection		Total n (%)	*p*, OR
	Yes n (%)	No n (%)		
Yes	20 (41.7)	28 (58.3)	48 (100)	p = 0.017
No	19 (22.1)	67 (77.9)	86 (100)	OR = 2.5
Total	39 (29.1)	95 (70.9)	134 (100)	

Tabel 2. The relationship between the underlying lesions of acne and *Demodex* infection

Underlying lesions	*Demodex*, fungal infection		Total n (%)	*p*, OR
	Yes n (%)	No n (%)		
Inflammatory papules				
Yes	25 (24)	79 (76)	104 (100)	p = 0.016
No	14 (46.7)	16 (53.3)	30 (100)	OR = 0.362
Pustules				
Yes	9 (15.5)	49 (84.5)	58 (100)	p = 0.002
No	30 (39.5)	46 (60.5)	76 (100)	OR = 0.282
Total	39 (29.1)	95 (70.9)	134 (100)	

The prevalence of *Demodex* and fungi in the group of patients with dry, exfoliative skin was 66.7%, higher than those without dry, exfoliative skin by 22 times. The difference was statistically significant ($p<0.05$) as shown in Table 5.

Discussion

The prevalence of Demodex and fungi in adult acne patients

The present study found that the prevalence of *Demodex* and fungi in adult acne patients was 29.1%. The prevalence of *Demodex* was 26% and fungi was 3.1%. The discovery of pathogenic microorganisms such as *Demodex*, fungi in acne patients, was a matter of global concern, but in Vietnam there had been little research on this.

In Vietnam, there were only a few studies that mention the presence of *Demodex* in other skin diseases, such as the research of Dang Thu Huong in 2005[4]. In total patients at Vietnam Dermatology Institute from September 2004 to August 2005, the prevalence of patients with dermatitis by *Demodex* accounted for very low (0.16%), the reason was that at that time dermatitis by *Demodex* was a new disease in Vietnam, the testing technique had not been finalized so it might have missed many cases.

In the world, the majority of studies on the relationship between acne and *Demodex* infection had been made in China, such as the study of Zhao Ya-e et al in 2011 with 129 acne patients in ages of 12 to 84[2]. The present study showed that a prevalence of severe *Demodex* infection ($\geq$5 cm^2) was 9.3%. This result was lower than ours because the study only recorded cases of severe *Demodex* infection.

According to a integrated study of the same author in 2012[3], the prevalence of *Demodex* in acne patients was 51.85%. The high prevalence of *Demodex* can be explained by the fact that these studies were community-based studies with a broader population (ages 1 to 78) and on general acne subjects, while the present study was performed at the hospital clinic and only on adult acne patients.

Table 3. The relationship between acne position and *Demodex*, fungal infection

Acne position	*Demodex*, fungal infection		Total n (%)	*p*, OR
	Yes n (%)	No n (%)		
Cheek				
Yes	39 (31.2)	86 (68.8)	125 (100)	$p = 0.047$
No	0 (0)	9 (100)	9 (100)	OR = 0.68
Total	39 (29.1)	95 (70.9)	134 (100)	

Table 4. The relationship between clinical form of acne and *Demodex*, fungal infection

Clinical form	*Demodex*, fungal infection		Total n (%)	*p*
	Yes n (%)	No n (%)		
Comedone acne	14 (58.3)	10 (41.7)	24 (100)	0.002
Pustular acne	20 (21.7)	72 (78.3)	92 (100)	
Nodulo-cystic acne	5 (27.8)	13 (72.2)	18 (100)	
Total	39 (29.1)	95 (70.9)	134 (100)	

Table 5. The relationship between dry, exfoliative skin and *Demodex*, fungal infection

Dry, exfoliative skin	*Demodex*, fungal infection		Total n (%)	*p*, OR
	Yes n (%)	No n (%)		
Yes	32 (66.7)	16 (33.3)	48 (100)	$p<0.001$
No	7 (8.1)	79 (91.9)	86 (100)	OR = 22
Total	39 (29.1)	95 (70.9)	134 (100)	

Several related factors

Table 1 showed a prominent symptom in patients with *Demodex* infection that was tingling sensation. Our study showed that the prevalence of *Demodex* and fungi in patients with tingling sensation was 41.7%, 2.5 times higher than those without feeling this. Dang Thu Huong study also noted that there were 62.5% patients with tingling sensation among subjects with dermatitis by *Demodex*[4]. According to Ha Nguyen Phuong Anh, the prevalence of patients with tingling sensation was 85%. The cause of these symptoms is that *Demodex* in the growth process concentrates more on the hair follicles and sebaceous glands and causes itching and tingling sensation in the face area[4,9]. This is an interesting feature noted in the study that could have symptomatic implications in screening pathogens. From the above data, it is possible to derive a clinical diagnostic experience that should be thought of as a possibility of infection with *Demodex*, fungi in patients with prolonged acne, persistent treatment with conventional acne treatment regimens. Thereby we make more timely and appropriate diagnostic tests, contributing to increase the effectiveness of treatment.

The prevalence of *Demodex*, fungi in inflammatory papules (24%) were lower than that in non-inflammatory papules (46.7%). Similarly, the prevalence of *Demodex*, fungi in cases with pustules (15.5%) were lower than that in cases without pustules (39.5%), the difference was statistically significant with $p<0.05$. Compared with Dang Thu Huong study (2005), in patients with dermatitis caused by *Demodex*, the prevalence of redness papules and pustules were only 40% and 17.8%, respectively, followed the prevalence of scales (81.1%) and vasodilatation (54.4%)[4]. Ha Nguyen Phuong Anh (2010) also reported in the research the same data with 18.33% with redness papules and 13.33% with pustules, much lower than the figure of 86.67% with dry

skin[5]. The results noted above can be explained by the characteristics of *Demodex*. When *Demodex* invades the skin, they parasitize the sebaceous gland, mainly the facial area, where frequent contact and friction create favorable conditions for *Demodex* to enter and develop. After fertilization on the surface of the skin, *Demodex* enters the hair follicles, sebaceous glands and spawns, pulling bacteria and fungi[4]. *Demodex* is capable of producing lipase enzymes that are essential for penetrating the skin and eating residues. When the amount of invaded *Demodex* increase, they can create horn formations on the hair follicle to reduce the excretion of residues and create scales, finally make the skin become dry and rough. This is one of the common symptoms of *Demodex* infection, which is dry skin, peeling, rather than inflammatory lesions. This feature is clinically very meaningful in targeting indications for pathogen screening.

Our results showed that the prevalence of *Demodex* and fungi focused on the cheek area (31.2%) compared to other sites on the face; the difference was statistically significant with $p<0.05$. Similarly, Dang Thu Huong showed that the most common site of lesions in *Demodex* dermatitis patients was cheek 66.7%[4]. The above characteristics can be explained by the fact that *Demodex* is a joint, temporarily parasitic insect in hair follicles, sebaceous glands. Wherever there is a hair follicle or a sebaceous gland, it can be infected with *Demodex*, but the most common location is the face (eyelid, nose, cheeks, forehead, temples, around mouth, nasal groove, outer ear canal). Often where there is a high density of sebaceous glands, the prevalence of *Demodex* will be high[3]. This feature has a guiding value for the pathogen sampling technique.

Table 4 showed that in cases of comedone acne, the prevalence of *Demodex* and fungi was 58.3%, higher than that in cases of pustular acne, nodulo-cystic acne. Differences were statistically significant with $p<0.05$. This finding was consistent with the data presented in our study of the underlying lesions of acne in patients when the number of non-inflammatory lesions prevailed (whiteheads, blackheads). No studies have documented the association between clinical form of acne and infection with *Demodex*, fungi.

On the other hand, in the group of patients with dry, exfoliative skin, the prevalence of *Demodex*, fungi (66.7%) was 22 times higher than the group without this symptom, the difference was statistically significant with $p<0.001$. This finding was consistent with Dang Thu Huong's study, when the most common lesions of *Demodex* dermatitis were dry skin, scales (81.1%), followed by vasodilatation (54.4%)[4]. This results in the presence of acne patients with symptoms of redness, vasodilatation, or scaly skin, which can be thought of by overexposure to microorganisms such as *Demodex* for additional screening tests.

Conclusion

The prevalence of *Demodex* and fungi in adult acne patients was 29.1%. Adult acne patients having dry, exfoliative skin, tingling sensation, cheek position, clinical form comedone acne are more likely to be infected with *Demodex* and fungi than those without these features. In contrast, patients with papules, pustules have a lower prevalence of *Demodex*, fungi than patients without these lesions.

What is already known on this topic?

With acne mechanisms, the authors usually mentioned on four main mechanisms (hyperkeratinization, excess of sebum secretion, inflammation and infection). Infection of *Propionibacterium acnes* was the most popular and it usually be focused on in treatment. However, in the recent years, acne situations which included the co-infection of *demodex* and fungi had increased. Therefore, treating acne in some cases needed to combine anti-parasitic and anti-fungal drugs.

What this study adds?

The use of topical creams containing corticosteroid weakened the immune ability of skin. Therefore, the parasites especially *Demodex* and fungi infection became more popular in acne patients in Vietnam and in some Asian countries because of the habit of using nourishing creams. The present study demonstrated that *Demodex* and fungi infections account for almost one-third in acne patients. Besides that, the most noticeable feature in these kinds of patients was tingling sensation suggesting that clinicians think about the co-infection of these microorganisms. Finally, acne lesions usually erupted on the cheeks and the skin situation usually dry and exfoliative. It was different from normal acne patients with the excess of sebum secretion.

Potential conflicts of interest

The authors declare no conflict of interest.

References

1. Goulden V, Clark SM, Cunliffe WJ. Post-adolescent acne: a review of clinical features. Br J Dermatol 1997; 136:66-70.
2. Zhao YE, Guo N, Xun M, Xu JR, Wang M, Wang DL. Sociodemographic characteristics and risk factor analysis of Demodex infestation (Acari: Demodicidae). J Zhejiang Univ Sci B 2011;12:998-1007.
3. Zhao YE, Hu L, Wu LP, Ma JX. A meta-analysis of association between acne vulgaris and Demodex infestation. J Zhejiang Univ Sci B 2012;13:192-202.
4. Dang HT. The study of clinical characteristics, pathogenic strains and the outcome of Demodex dermatitis treatment at Vietnam Dermatology Institute. Ha Noi: Ha Noi University of Medicine and Pharmacy; 2005.
5. Nguyen AP. Conditions and clinical characteristics of patients with Demodex foliculitis. J Vietnam Med 2010;11:19.
6. Hoang MV. Diagnosis skin diseases by picture and treatment. Ho Chi Minh City: Vietnamese Medical Publisher; 2000.
7. Huynh BV. Situation, clinical characteristics and results of treating acne by isotretinoin of acne patients who