

Does cigarette smoking influence acne?

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Introduction: Acne is a common problem in adolescent and young age groups, for which several risk factors have been suggested. One of the risk factors is smoking. In studies on the relationship between smoking and acne, conflicting results have been obtained.

Method: This study was conducted on 133 male patients who were visited at the dermatology clinic of Imam Reza hospital due to acne as the case group, and 133 healthy individuals without any skin diseases including acne among those accompanying the patients as the control group. The case and the control groups were age matched. For each patient who had the criteria for inclusion in the study, a questionnaire was completed and the necessary information was collected and then analyzed statistically.

Result: The questionnaires were filled for 133 patients with acne and 133 healthy controls. Twenty-nine patients with acne (21.8%) and 12 patients in the control group (9.1%) were smokers, and the difference between them was significant ($P = 0.004$). The number of cigarettes smoked per day was significantly different in the two groups (4.75 in the case group versus 1.88 in the control group). No correlation was found between smoking and acne localization, severity of acne, the type of lesion, symptomatic or asymptomatic nature of acne and acne complications. In the case group, the smokers developed acne at an older age than the non-smokers.

Conclusion: Patients with acne were more likely to smoke than patients without acne; thus, smoking might be a factor affecting the incidence of acne.

Keywords: acne, association, male, smoking

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INTRODUCTION

Acne is one of the most common skin problems in the adolescent and young age groups, for which multiple risk factors have been suggested. One of these risk factors is smoking that has been less dealt with, and just a handful of papers in this field are available. Smoking is a very important and reversible risk factor of illness and death. Tobacco is directly associated with cardiovascular disease, chronic bronchitis and many malignant diseases. Tobacco has also many skin effects, most of which

are harmful¹. Cigarette smoking is associated with a variety of skin diseases like psoriasis, pustular palmoplantar psoriasis, suppurative hidradenitis, systemic and discoid lupus erythematosus, and cancers in some areas such as the lip, oral cavity and anogenital regions¹⁻³. A controversial relationship between smoking and melanoma, cutaneous squamous cell carcinoma, basal cell carcinoma and acne has been also proposed³.

In contrast, smoking seems to have a protective effect against rosacea, labial herpes simplex, pemphigus vulgaris and dermatitis

herpetiformis^{1,2,4}. Smoking is directly responsible for certain dermatoses such as nicotine stomatitis, black hairy tongue, periodontal diseases and some types of urticaria and contact dermatitis¹. Tobacco smoke is a complex mixture of gaseous and particulate compounds, many of which have the potential of causing physiological and pharmacological effects⁵. The skin is an organ in contact with cigarette smoke both directly through contact with environmental smoke and indirectly as the toxic substances entering into the blood stream by smoke inhalation¹.

In studies about the effect of smoking on acne, conflicting results have been achieved so far. A positive relationship between the incidence of acne and smoking has been shown by some researchers^{6,7} while in other studies, a protective effect for smoking has been suggested⁸⁻¹⁰. Given the contradictory results of these studies and the fact that no study in this regard has been so far performed in the North East of Iran, we set out to investigate the relationship between acne vulgaris and cigarette smoking in young men.

PATIENTS AND METHODS

This case-control study was conducted to evaluate the smoking habits in male patients 15-30 years old with acne, who were referred to the dermatology clinic of Imam Reza hospital in Mashhad during 2008-2010. Using non-probability and easy sampling method, 133 cases of acne patients entered the study along with the same number of healthy individuals without any skin diseases including acne among those accompanying the patients to the dermatology clinic who were matched for age with patients as controls. Participants' information including age, education level, occupation, age of onset, site and type of lesions, acne symptoms and complications, smoking, age of smoking start, the number of cigarettes smoked per day was entered in the questionnaires. Inclusion criteria were male gender between 15 to 30 years old with acne. Smoking at least one cigarette weekly at the time of the study was regarded a criterion for being an active smoker. Passive smokers and ex-smokers were considered as non smokers. After obtaining consent and completing the questionnaire in the clinic, each patient was examined by a dermatologist. The questionnaire which contained

information about the location of acne, severity of acne, complications of acne and also the patients' specifications was filled anonymously and then the data about smoking habits were entered by the patient himself. Statistical analysis was performed using independent t-test and Chi-square tests using SPSS version 11.5.

RESULTS

Mean and standard deviation of age in patient and control groups were 20.54 ± 3.53 and 20.32 ± 3.9 years, respectively. Independent t-test suggested no significant difference in age between case and control groups. The most frequent age group in both the cases and controls was 19 to 22 years old. The most common age of onset of acne was 15-17 years. The face was involved in all the cases followed by the back, chest and shoulder, respectively. About 75.2% of the patients had closed comedones, 85.7% had open comedones and 62.4% had inflammatory lesions. In terms of the acne severity, 3% had mild, 65.4% had moderate and 31.65% had severe acne. Acne lesions were symptomatic in 35.3% of the patients. Complications of acne included hyperpigmentation (92.5%), atrophic scars (48.9%), and keloids and hypertrophic scars (5.3%). Regarding the educational level, 33.8% had unfinished high school studies, 46.6% had high school diploma, 9% had an associate degree, and 10.5% had a bachelor's degree or higher. About 33.1% of the patients were employed and 66.9% were unemployed.

According to Table 1, there was a significant relationship between acne and smoking ($P = 0.004$). The number of cigarettes smoked was also significantly higher in patients with acne as compared to controls ($P = 0.049$) (Table 2). The onset age of smoking in patients with acne in most cases was in the age range 18-21. There was no significant relationship between smoking

Table 1. Frequency distribution of smoking habits among acne patients and control group

Smoking	Group			
	Acne patients		Control group	
	No	Percent	No	Percent
Yes	29	21.8	12	9.1
No	104	78.2	121	90.9
Total	133	100	133	100
P-value	0.004			

Table 2. Frequency distribution of the number of cigarette consumed per day by acne patients and control group

Cigarettes per day	Group		
	Acne patients	Control group	
1-3	No	13	5
	Percent	9.8	3.8
4-6	No	6	4
	Percent	4.6	3.1
7-9	No	1	2
	Percent	0.8	1.5
>9	No	9	1
	Percent	6.9	0.8
X ± SD		19.20 ± 4.75	8.80 ± 1.11
P-value		0.049	

and acne location, severity of acne, type of acne lesions, symptomatic lesions and complications of acne ($P > 0.05$). There was a significant difference in the level of education between smoker and non-smoker acne patients ($P = 0.03$); in other words, the frequency of having a bachelor's degree or higher education was more in the smokers, and the frequency of unfinished high school education was higher in non-smokers. In patients with acne, there was a significant difference in age at acne onset between smokers and nonsmokers and the smokers developed acne at an older age ($P < 0.005$).

DISCUSSION

The first study to examine the relationship between smoking and acne was conducted in 1992 by Mills et al¹⁰. Since then, other studies have been done and the results of which are in apparent contradiction. The relationship between smoking and acne was positive in our study, so that patients with acne were more likely to smoke than non-acne patients. Similar to a study conducted by Schafer et al, the prevalence of acne in active smokers (40.8%) was higher as compared to non-smokers (25.2%) in our study⁶. In a study by Chuh et al, it was concluded that smoking was likely to have a positive association with acne in men⁷. Cigarettes contain arachidonic acid and polycyclic aromatic hydrocarbons, which lead to a phospholipase A2-dependent inflammatory pathway. This effect may further stimulate the synthesis of arachidonic acid. Smokers also have a diet low in unsaturated fats and high in saturated fats. The intake linoleic acid is especially lower in them in comparison with non-smokers¹¹.

However, no association has been found in some studies. For example, in a study performed by Firooz et al, 293 patients with acne and 301 patients with other skin diseases were examined. Twelve acne (4.1%) and 27 control patients (9.0%) were current smokers ($P < 5\%$). After adjustment for age, this difference was not clear¹². In another study undertaken by Jemec in 2002, the participants were under examination for allergic skin diseases. The prevalence of clinical acne was 40.7% for men and 23.8% for women. In this study, no statistically significant association was found between acne and smoking¹³.

On the other hand, some studies have reported a negative relationship. In a study by Rombouts et al in 2007, patients with acne were less likely to smoke than controls⁸. In another cohort study by Klaz et al in 2006, active smokers showed a significantly lower incidence of severe acne (0.71%) than non-smokers (1.01%)⁹. In the study by Mills et al, the hypothesis that some compounds of cigarette, like nicotine, had a possible anti-inflammatory effect on acne was supported¹⁰.

In cases with an inverse effect between smoking and acne, an anti-inflammatory effect has been attributed to smoking. Nicotine enhances the keratinocyte adhesion and differentiation, and inhibits apoptosis and migration of keratinocytes¹⁴. Nicotine also inhibits inflammation through effects on the central and peripheral nervous system¹⁵. Nicotine changes the immune system through direct interference with T cell responses. Use of transdermal nicotine reduces the response to sodium lauryl sulfate, and decreases erythema against UVB¹⁰. Smoking may affect some trends in the pathogenesis of acne. A potential mechanism is by reducing skin blood flow secondary to inhibition of endothelial synthesis of prostaglandin causing vascular contraction¹⁶. In general, smoking exerts immunomodulatory effects by releasing reactive oxygen species from the tobacco smoke, which is believed to unchain a cascade of harmful effects on normal inflammatory cells^{17,18}. In addition, synthesis and precipitation of mature collagen in the extracellular matrix is reduced by smoking¹⁸.

Explaining the relationship between smoking and acne is not easy. Disorders in the vascular function, collagen synthesis and wound healing may be partially responsible for the effect of smoking on the development of acne^{2,19,20}. In contrast, the

relationship between smoking and suppurative hidradenitis is better known. Previous studies have shown that about 85% of such patients smoke, and smoking may be effective on the function of apocrine glands and neutrophilic granulocytes²¹⁻²³. According to another observation, the incidence of smoking in patients with suppurative hidradenitis amounts to 80%²³.

Mental stress is a known risk factor for smoking²⁴. Most smokers due to stress are expected to be in the severe acne group⁹. Therefore, the relationship between smoking and acne, instead of being a cause and effect relationship, might be a simultaneity relationship secondary to stress from acne, with acne causing stress (especially in younger persons) stimulating them to smoke.

The difference in the results of such studies could be due to methodology differences between the study populations. In our study and that of Firooz¹², controls were selected from those without acne, but in the study by Mills, they were selected from the general population¹⁰ that may also be affected by acne. In the study performed by Mills, the case group only consisted of those with severe acne treated with isotretinoin¹⁰ with a selection bias because the individuals with mild acne were not enrolled. We also had a selection bias in our case group, as they were selected from patients referred to the hospital and naturally the possibility of more severe acne was higher in them. Therefore, as compared to the general population, they could have had more stress which might have increased the likelihood of smoking. Other differences can be related to the definition of smoking and acne or volume of the selected sample. The advantage of our study was that our samples were selected from men, which eliminated confounding factors such as sex hormones related to gender.

In our study, no relationship was found between the severity of acne and smoking, but in a study by Rombus, acne was less severe in female smokers⁸. The justification is that smoking has immunosuppressive effects, affecting the cells through innate immunity factors such as macrophages, neutrophils and natural killer cells and also by adaptive immunity such as B and T lymphocytes²⁵. These observations prove that cigarette smoking probably inhibits the inflammatory components of acne more than non-inflammatory components⁸. In a study conducted

by Shufer, a clear dose-dependent relationship was found between acne severity and daily cigarette smoking⁶. The lack of relationship between the severity of acne and smoking in our study may be due to the higher number of moderate and severe cases of acne among our patients relative to the mild cases.

Our study showed that cigarette smoking did not affect the involvement site, inflammatory or non-inflammatory lesions, symptoms and complications of acne. In the case group, there was a significant relationship between the education level and the probability of smoking; in other words, those with higher education were more likely to smoke. Of course, many participants with low levels of education were students without a known future education status, and those with higher education were often older than those with lower education levels and were subject to more stress over time, increasing the likelihood of cigarette smoking in them.

Patients with acne are more likely to smoke than patients without acne, and thus smoking can affect the development of acne. The study should be conducted on more samples to obtain more information in this regard. Sampling should be from the general population in order not to restrict the samples to more severe types of acne. Stress and anxiety can be investigated in future studies of acne. Further in-depth studies to investigate the relationship between the age of starting smoking and onset age of acne are recommended.

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