

The relationship between body mass index and the severity of acne

Vahideh Lajevardi, MD
 Seyede Zahra Ghodsi, MD
 Maryam Daneshpazhooh, MD
 Homa Kazemi, MD
 Zeinab Aryanian, MD
 Azadeh Goodarzi, MD

Department of Dermatology, Tehran University of Medical Sciences, Razi Hospital, Tehran, Iran

*Corresponding Author:
 Azadeh Goodarzi, MD
 Department of Dermatology, Tehran University of Medical Sciences, Razi Hospital, Tehran, Iran
 Email: azadeh_goodarzi1984@yahoo.com*

Conflict of interest: none to declare

*Received: 10 October 2013
 Accepted: 20 December 2013*

Background: Acne vulgaris is a common skin disorder that affects 79% to 95% of the young population. Some studies have focused on the role of overweight and obesity in initiation and exacerbation of acne. This study investigated the relationship between BMI and the severity of acne.

Method: This cross-sectional study was conducted on 107 acne patients. One form was completed for each patient with regard to demographic characteristics including age, sex, weight, height, BMI, and also the severity of acne based on the Global Acne Severity Scale (GEA Scale), duration of the disease, type of medication, smoking history, duration of exposure to sunlight and intake of dairy products and chocolate.

Result: In this study, 93 patients (86.9%) were female and 14 patients (13.1%) were male, with a mean age of 22.5 years. The mean BMI of the participants was 23.36 kg/m². With regard to acne severity groups, the moderate acne group had the highest frequency in total (37.4%). The highest mean BMI was seen in the very severe acne group (24.4 kg/m²), and the lowest mean BMI was observed in the severe acne group (21.86 kg/m²). There was no significant correlation between the acne severity and BMI (p=0.806). The mean disease duration was 4.13 years, which was not significantly associated with BMI. There was no significant association between the type of medical therapy and BMI.

Conclusion: The prevalence of acne with severity more than moderate was much lower in patients who were underweight (BMI less than 18.5). However, this study showed no statistically significant difference in BMI among people with different severities of acne. Population-based studies, as well as age restriction of the participants, can lead to more accurate and reliable results in this regard.

Keywords: acne, body mass index, severity

Iran J Dermatol 2014; 17: 13-17

INTRODUCTION

Acne vulgaris is a common skin disorder that affects 79% to 95% of the young population. In United States, 40% to 45% of men and women older than 25 years of age have some degrees of facial acne that continues to the middle age in 12% of women and 3% of men¹. Acne is a sign of maturity²

and is a major cause of visiting general physicians in the first level or dermatologists in the second level, which leads to increased expenditure³⁻⁴. Also, acne has an undeniable role in psychological problems as well as scar formation⁵.

Obesity is one of the biggest problems in western life style. In 2008, the World Health Organization (WHO) estimated that 35% of adults (aged 20

years or more) were overweight all around the world. Initially, it was believed that overweight and obesity is a problem that occurs in high-income countries while nowadays, this problem is increasing in low and middle-income countries⁶. Obesity has a dramatic influence on the level of free testosterone levels and sex hormone binding globulin (SHBG). In the studies on obese women, higher levels of testosterone, lower levels of SHBG and also higher androgen index is observed than thin women⁷⁻⁸. A higher body mass index (BMI) is associated with an increased incidence of polycystic ovary syndrome (PCOS) that presents with hyperandrogenism, acne, hirsutism and menstrual irregularities; also, obese women with PCOS have a more severe clinical presentation of hyperandrogenism rather than thin women suffering from this disease⁹⁻¹⁰. Obesity affects skin physiology through changing the barrier function of the skin, lipid production, sweat glands and lymphatic function, collagen formation, wound healing, subcutaneous fat, and microscopic and macroscopic blood circulation¹¹. The impact of obesity on many skin diseases has been established such as acanthosis nigricans, acrochordon, keratosis pilaris, hyperandrogenism, hirsutism, striae cutis distensae, adiposis dolorosa, fat redistribution, lymphedema, plantar hyperkeratosis, cellulitis, skin infections, suppurative hidradenitis, psoriasis, insulin resistance syndrome and many other conditions that may be exacerbated by obesity¹¹⁻¹³.

Since fat tissue is the site of androgen production¹⁴, the undeniable role of obesity in peripheral hyperandrogenism is clear (as mentioned in PCOS)¹⁵ and the effect of hyperandrogenism on increased activity of the sebaceous glands and more oil production, as an important factor in acne development, is obvious. Since no study has ever been conducted in Iran on the prevalence or severity of acne in patients based on their BMI, it could be useful to investigate this relationship.

In addition, we examined the association between other factors such as dairy products, chocolate, sun exposure and smoking with the severity of acne.

PATIENTS AND METHODS

This study was conducted on 107 patients who were visited at the Dermatology Clinic of Razi Hospital, Tehran, Iran, with the complaint of acne in June 2012. It should be noted that the acne severity of all patients who entered the study was almost clear or higher, based on Global Acne Severity Scale (GEA Scale). Eligible patients, after visit by the residents of dermatology in the clinic, were introduced to the main investigator of this study if they consented to participate in the study. They received information on the objectives, importance, and method of this project and were assured of the confidentiality of the information. After obtaining informed consent, patients were enrolled in the study. A questionnaire, which contained two parts, was completed for each patient. The first part was about demographic characteristics including age, sex, weight, height, BMI and severity of acne and the second part included questions about the disease duration, medical history, type of the drugs, history of isotretinoin use, duration of daily exposure to sunlight, milk consumption during the day, amount of chocolate consumption in one week, and smoking history. Height and weight of the patients were measured in the clinic of Razi Hospital by the investigator. Disease severity was also calculated based on GEA scale (Table 1).

Information was obtained from patients through a questionnaire and was recorded in a form. All data were entered into SPSS-20 Macintosh software and analyzed with statistical tests such as independent T-test, Chi-square, and Analysis of Variance between groups (ANOVA). P values less than 0.05 were considered statistically significant.

Table 1. Classification of acne by Dreno and colleagues (GEA scale)

Clear	No lesions with residual pigmentation and erythema may be seen
Almost clear	Almost no lesions with a few scattered open or closed comedones and very few papules
Mild	Less than half of the face is involved with a few open or closed comedones and a few papules and pustules
Moderate	More than half of the face is involved with many papules and pustules and many open or closed comedones. One nodule may be present.
Severe	The entire face is involved, covered with many papules and pustules, open or closed comedones and rare nodules.
Very severe	Highly inflammatory acne covering the face with the presence of nodules.

RESULTS

From 107 patients who participated in this study, 93 patients (86.9%) were female and 14 patients (13.1%) were male. Their age ranged from 11 to 36 years with a mean age of 22.5 years. Height and weight were measured and BMI was also calculated for all the participants (Table 2). Among the participants in this study, only 2 patients (1.9%), 1 man and 1 woman, were smokers. Sunlight exposure was from 0 to 11 hours a day. Chocolate consumption was from 0 to 7 days a week. Dairy product consumption was variable among 8 units in a day to none at all. Duration of disease was from 2 months to 17 years (Table 3).

The highest frequency among acne severity groups was seen in the moderate group (37.4%, 40 patients). In general, 92.5% of the patients had moderate or lower disease severity, and only 8 patients (7.5%) were in the severe and very severe acne groups. Among women, the highest frequency was seen in the mild acne group with 35 women (37.6%) followed by the moderate acne group with 30 women (32.2%). However, in men, the

moderate acne group had the highest frequency including 10 males (71.4%) followed by the almost clear acne group with 2 males (14.2%). The history of medical treatment was positive in 83 patients (77.6%) of whom 52 patients received both oral and topical anti-acne therapies, 19 patients only received topical and 12 patients only received oral treatment. Twenty-one (19.6%) out of the 107 patients had a history of isotretinoin use. The highest mean BMI (24.40 kg/m²) was observed in the very severe acne group and the lowest in the severe acne group (21.86 kg/m²). There was no significant correlation between acne severity and BMI (p=0.806) (Table 4). No statistically significant relationship was observed between BMI and disease duration or the type of treatment such as topical or oral antibiotics or isotretinoin (p>0.05).

The average sun exposure duration was 1.71±1.92 hours per day in all patients. Sun exposure was related to acne severity so that the longest exposure was observed in very severe acne group (2.33 hours per day), and the shortest was seen in the almost clear acne group (1.21 hours per day). However, this relationship was not statistically significant (p = 0.654). This study detected a significant direct association between chocolate consumption and the severity of acne in total (P = 0.023). The mean chocolate consumption was 1.67 days per week; the highest consumption was observed in the moderate acne group (2.6 days per week) while the lowest was seen in the severe acne group (0.8 days per week). The mean consumption of dairy products was 2.29 units per day; the highest consumption was observed in the moderate acne group (2.63 units) while the lowest was seen in the almost clear group (1.93 units per day), which showed no statistically significant correlation with the severity of acne (p = 0.72). Moreover, there was no statistically significant relationship between smoking and disease severity (p>0.05).

Table 2. Mean age, weight, height and BMI

	Mean	Std. Deviation
Age	22.50	5.18
Weight	62.24	12.06
Height	163.14	7.84
BMI	23.36	4.18

Table 3. Mean sun exposure, and consumption of dairy products and chocolate

	Mean	Std. Deviation
Sun exposure (hours per day)	1.71	1.92
Chocolate (days per week)	1.67	2.32
Dairy (units per day)	2.29	1.42
Disease duration (years)	4.13	3.34

Table 4. Mean BMI in the different severity degrees of the disease

BMI for Severity	N	Mean	Std. Deviation	95% CI for Mean		ANOVA
				Lower Bound	Upper Bound	Sig.
Almost clear	23	22.98	4.05	21.23	24.73	0.80
Mild	36	23.90	4.56	22.35	25.44	
Moderate	40	23.21	3.62	22.05	24.38	
Severe	5	21.86	4.06	16.81	26.90	
Very Severe	3	24.4	8.93	2.2	46.59	
Total	107	23.36	4.18	22.56	24.17	

DISCUSSION

The mean BMI in this study was 23.36 and the severity of acne was determined according to classification of Dreno and colleagues (GEA scale) in all patients¹⁶. As it is clear, in general, the moderate acne group had the highest frequency. Among women, the mild acne group followed by the moderate acne group had the highest frequency and among men, the moderate group had the highest frequency followed by the almost clear group. This finding means that despite the lower number of men in the study, they had more severe acne than women. It may show the higher compliance of men to acne than the women, which is logical with regards to the fact that women are more concerned about cosmetic problems.

In a study conducted by Halvorsen and colleagues on adolescents aged 18-19 years, the prevalence of moderate and severe acne in girls with BMI \geq 25 kg/m² was higher than other girls¹⁷. In a study performed by Tsai and colleagues, it was found that BMI in children with inflammatory acne lesions was higher than the BMI in children with comedones; they also showed that children with BMI less than 18.5 had less acne than normal-weight or overweight children and also less inflammatory lesions compared with others¹⁸. However, in a study by Borgia, the mean BMI showed no statistically significant difference in different severity groups of acne¹⁹.

The main objective of this study was to evaluate the effect of BMI on the severity of acne, which demonstrated that the mean BMI was not significantly different among acne severity groups. The results of our study are consistent with the results of the study conducted by Borgia¹⁹. Our study failed to confirm the hypothesis regarding the effect of BMI on the severity of acne through the induction of peripheral hyperandrogenism. Among the evaluated factors (smoking, chocolate and dairy consumption, sun exposure), only chocolate consumption had a statistically significant relationship with the severity of acne. In a study performed by Ghodsi²⁰ in Iran, no correlation was found between cigarette smoking and exposure to sunlight with the severity of acne but consumption of sweets, nuts, chocolate and fatty foods were associated with more severe acne. This study also showed a significant direct correlation between

chocolate consumption and the increased severity of acne while there was no correlation between the severity of acne and smoking or exposure to sunlight. Therefore, it is reasonable to limit the consumption of sweets such as chocolate in acne which has a direct effect on the acne severity. However, sun exposure, smoking, and consumption of dairy products do not seem to aggravate the acne severity and therefore, restriction of their use is not necessary.

Most international studies in this regard have very large sample sizes and a population-based design. Moreover, these studies are performed on very limited age groups (for example on teenagers aged 18-19 years in the study performed by Halvorsen et al¹⁷, and people older than 17 years in the study by Borgia¹⁹). It could be possible to achieve more accurate results through including limited age groups, conducting population-based studies, increasing the sample size, and indicating more precise and reliable measurement tools. Given the high prevalence of acne and the lack of such studies in our country, and also considering the effect of cultural differences on diet and genetic susceptibility to acne, it seems necessary to design and conduct these types of studies to further evaluate the association of these factors with acne.

REFERENCES

1. Cordain L, Lindeberg S, Hurtado M, et al. Acne vulgaris a disease of western civilization. *Arch Dermatol* 2002; 138: 1584-90.
2. Diane MT, John SS. Disease of the sebaceous glands. In: Irwin MF, Arthur ZE, Klaus W, et al, eds. *Dermatology in general medicine* 2003; 6th ed. New York: McGraw-Hill: 672-84.
3. Cypress BK. Health care of adolescents by office based physicians. Washington: US Government Printing Office. NIH publication No. 99. 1984.
4. Rothman KF, Lucky AW. Acne vulgaris. In: Callen JP (Editor). *Advances in dermatology*. Vol. 8. St. Louis. Mosby Book 1993: 347-74.
5. Lucky AW, Biro FM, Huster GA, et al. Acne vulgaris in premenarchal girls. An early sign of puberty associated with rising levels of dehydroepiandrosterone. *Arch Dermatol* 1994;130:308-14.
6. Mean body mass index: <http://www.who.int/gho/ncd/risk-factor/bmi.text/en>
7. Bernasconi D, Del Monte P, Meozzi M, et al. The impact of obesity on hormonal parameters in hirsute and nonhirsute women. *Metabolism* 1996;45:72-5.
8. Cupisti S, Dittrich R, Binder H, et al. Influence of body

- mass index on measured and calculated androgen parameters in adult women with hirsutism and PCOS. *Exp Clin Endocrinol Diabetes* 2007;115:380-6.
9. Huppert J, Chiodi M, Hillard PJ. Clinical and metabolic findings in adolescent females with hyperandrogenism. *J Pediatr Adolesc Gynecol* 2004;17:103-8.
 10. Gambineri A, Pelusi C, Manicardi E, et al. Glucose intolerance in a large cohort of Mediterranean women with polycystic ovary syndrome: phenotype and associated factors. *Diabetes* 2004;53:2353-8.
 11. Yosipowitch G, DeVore A, Dawn A. Obesity and the skin: skin physiology and skin manifestations of obesity. *J Am Acad Dermatol* 2007;56:901-16.
 12. Hahler B. An overview of dermatological conditions commonly associated with the obese patient. *Ostomy Wound Manage* 2006;52:34-6.
 13. Scheinfeld NS. Obesity and dermatology. *Clin Dermatol* 2004; 22:303-9.
 14. Samojlik E, Kirschner MA, Silber D, et al. Elevated production and metabolic clearance rates of androgens in morbidly obese women. *J Clin Endocrinol Metab* 1984; 59: 949-54.
 15. Pasquali R, Casimirri F. The impact of obesity on hyperandrogenism and polycystic ovary syndrome in premenopausal women. *Clin Endocrinol (Oxf)* 1993;39: 1-16.
 16. Dréno B, Poli F, Pawin H, et al. Development and evaluation of Global Acne Severity Scale (GEA Scale) suitable for France and Europe. *J Eur Acad Dermatol Venereol* 2011; 25:43-8.
 17. Halvorsen JA, Vleugels RA, Bjertness E, Lien L. A population-based study of acne and body mass index in adolescents. *Arch Dermatol* 2012;148:131-2.
 18. Tsai MC, Chen W, Cheng YW, et al. Higher body mass index is a significant risk factor for acne formation in schoolchildren. *Eur J Dermatol* 2006;16:251-3.
 19. Borgia F, Cannavo S, Guarneri F, et al. Correlation between endocrinological parameters and acne severity in adult women. *Acta Derm Venereol* 2004; 84: 201-4.
 20. Ghodsi SZ, Orawa H, Zouboulis CC. Prevalence, severity, and severity risk factors of acne in high school pupils: a community-based study. *J Invest Dermatol* 2009;129:2136-41.