Original Article

Relationship Between BMI, Dietary and Lifestyle Characteristics and the Severity of Acne vulgaris

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Abstract

Background: Acne is believed to impact around 9.4% of the global population, positioning it as the eighth most widespread condition on the globe. **Objectives:** to assess if BMI (among other risk variables) has an influence on severity of acne vulgaris. **Material and Methods:** This is a cross-sectional study that included 120 patients and was conducted at dermatology clinic from the 3rd of May 2023 to the 3rd of March 2024. A total of 120 patients were included. Patients sociodemographic characteristics were recorded (age and sex), as well as BMI and the following information: age of onset, smoking, excessive consumption of sweets, milk or dairy products, fats, spices, the presence of psychological stress, family history of acne, and the daily duration of sunlight exposure. All the patients were thoroughly examined by the attending dermatologist and the acne was graded into mild, moderate, and severe. **Results:** Statistical analysis revealed no significant association between the severity of acne and BMI. Furthermore, no significant association was found between the severity of acne and each of the following risk factors: smoking, cosmetic, milk or diary consumption, spicy diet, fatty diet and family history. Whereas higher severity was significantly associated with increased sugar consumption, stress, and more hours of sunlight exposure. **Conclusion**: Based on the findings of the present study, BMI was not significantly associated with the severity of acne vulgaris. Among other dietary and lifestyle characteristics, sugar consumption, stress, and increased exposure to sunlight were predictors of severity. However, larger population sized studies are essential to validate these findings.

Keyword: BMI, Dietary, Lifestyle, Acne vulgaris

Introduction

Acne vulgaris, a commonly seen chronic inflammatory skin condition among adolescents, is increasingly being observed in maturity, particularly among women [1, 2]. There are two kinds of female acne that are distinguished based on the time of beginning. The first subtype is persistent acne, which refers to acne that continues or reoccurs from adolescence. The second subtype is late-onset acne, which refers to acne that emerges for the first time in adulthood, namely at 25 years of age or older [3]. Acne is believed to impact around 9.4% of the global population, positioning it as the eighth most widespread condition on the globe [4]. According to research, a significant proportion of individuals within the age range of 12 to 24, which is about 85 percent, encounter varying degrees of acne, even if it is just of a mild nature [5]. During the period of puberty, the secretion

of sebum is augmented due to the effect of androgens. This occurs as a result of the conversion of testosterone to a more powerful form known as dihydrotestosterone (DHT) by the enzyme 5-alpha reductase. DHT then binds to particular receptors located in the sebaceous glands, so stimulating an increase in sebum production. Consequently, there is an augmented hyperproliferation of the epidermis inside the hair follicles, resulting in the accumulation of sebum. The rupture of distended follicles leads to the release of pro-inflammatory substances inside the dermis, so initiating an inflammatory response. C. acnes, Staphylococcus epidermis, and Malassezia furfur are known to elicit inflammatory responses and stimulate the proliferation of follicular epidermal cells. [6] Propionibacterium acnes (P. acnes) is recognized as a significant contributor to the development and progression of acne. Propionibacterium acnes (P. acnes) is a kind of bacterium that is gram-positive, anaerobic, and microaerophilic. It is mostly located in the sebaceous follicle and serves as the predominant bacterial species in the human sebaceous gland, constituting around 90% of the bacterial 16S transcripts. P. acnes is well recognized as a significant contributor to the development of acne vulgaris, mostly by its ability to induce an inflammatory response in the host. Staphylococcus epidermidis is also found inside follicles, but in close proximity to the surface, hence implying its limited involvement in the underlying inflammatory process. [7] It is also influenced by environmental pollutants, the social environment, and changes in dietary patterns and lifestyle, such as increasing air pollution, sweets consumption, staying up late, social networks, and social media[8]. Many cosmetics, including some sunscreens, include comedogenic ingredients. Isopropyl myristate, lanolin, butyl stearate, stearyl alcohol, and oleic acid are some well-known comedogenic cosmetic chemicals. [8] Medications such as lithium, steroids, and anticonvulsants are used. Currently, there is a lack of a globally acknowledged categorization or grading system for acne. An effective approach for classifying and grading acne utilizes historical and clinical patterns to establish a diagnosis and determine appropriate treatment options. [9] The inflammatory manifestations seen in acne consist of several types of lesions, such as papules, pustules, nodules, and pseudocysts, which are characterized by their distinct physical attributes. According to previous research, inflammatory acne lesions often elicit discomfort. [10] Papules have a diameter of less than 5 mm. Pustules are characterized by the presence of a visible central core consisting of purulent material. Nodules have a diameter exceeding 5 mm. Nodules have the potential to develop into suppurative or hemorrhagic forms. Suppurative nodular lesions have been designated as cysts due to their similarity to inflammatory epidermal cysts. The repeated occurrence of cyst rupture and subsequent re-epithelialization results in the formation of sinus tracts lined with epithelial cells, which are often accompanied by the development of unsightly scars. The assignment of a severity grade, based on an estimate of lesion count, is categorized as mild, moderate, or severe [11]. Noninflammatory lesions consist of open and closed comedones, Mild acne vulgaris shows limited number of lesions with few inflammatory ones. Moderate acne exhibit more inflammatory lesions, while severe form shows several inflammatory lesions (more than 50) and more comedones (more than 100) [11]. Aim of Study to assess if BMI (among other risk variables) has an influence on severity of acne vulgaris

Materials and Methods

Study design

An analytic cross sectional study has been conducted at dermatological clinic from the 3rd of May 2023 to the 3rd of March 2024.The participants involved were patients who presented to the dermatology clinic and diagnosed with acne vulgaris. Patients with Behcet disease and patients taking drugs that induce acne like topical and systemic steroids were excluded. Verbal consent has been obtained from all participants before data collection. A total of 120 patients were included. Patients sociodemographic characteristics were recorded (age and sex), as well as the following information: age of onset, smoking, excessive consumption of sweets, milk or dairy products, fats, spices, the presence of psychological stress, family history of acne, and the daily duration of sunlight exposure. All the patients were thoroughly examined by the attending dermatologist and the acne was graded into mild, moderate, and severe. For the assessment of BMI, electronic weight and height scales were used. Before weight measurement, patients were asked to empty their pockets and take off their shoes. After the calculation of BMI, the BMI readings were classified into: underweight, normal weight, overweight, and obese; as the following:

1. For patients <18 years: The CDC growth charts for BMI Categories for children and teens were employed; as the following:

Table 1: The CDC growth charts for BMI for children and teens[8].

BMI Category	BMI Range
Underweight	Less than the 5th percentile
Healthy Weight	5th percentile to less than the 85th percentile
Overweight	85th percentile to less than the 95th percentile
Obesity	95th percentile or greater

2. For patients >18 years, the BMI was classified as the following:
   - **A.** Underweight: <18.5 Kg/m^2.
   - **B.** Normal weight: 18.5 – 24.9 Kg/m^2.
   - **C.** Overweight: 25.0 – 29.9 Kg/m^2.
   - **D.** Obese: ≥ 30 Kg/m^2.

Statistical analysis

Data entry was done using Microsoft Excel 2019. Data was recorded into different quantitative and qualitative variables for the purpose of analysis. Analysis was done using statistical package for social sciences (SPSS version 26). Data was summarized using measures of frequency (mean), dispersion (standard deviation), and tables. A p value of ≤0.05 was assigned as a criterion for declaring statistical significance.

Ethical Approval

The Hammurabi College of Medicine at the University of Babylon ethical committee approved this study's ethical approval, obtaining verbal consent from each patient and control. A local ethics committee reviewed and approved the subject information and consent form.

Results

A total number of 120 patients were included in the study sample.The age distribution of the studied sample ranged from (11-24) with a mean of (17.94 years ± 2.781 SD), with more than half of the sample (52.5%) being ≥18 years. Regarding sex distribution; it showed a slight female predominance, as the female to male ratio was 1.26:1. Concerning BMI the majority (64.2%) was of normal BMI: as illustrated in table (2)

Table 2: Age, sex and BMI characteristics of the studied sample.

Sociodemographic characteristics	Frequency (N=120)	Percentage (%)
Age		
<18 years	57	47.5
≥18 years	63	52.5
Sex		
Male	53	44.2
Female	67	55.8
BMI		
Underweight	20	16.7
Normal weight	77	64.2
Overweight	17	14.1
Obese	6	5.0

Clinical characteristics of acne: The age of onset distribution of the studied sample ranged from (10-19 years) with a mean of (15.0 years ± 1.8 SD); with the majority of patients (87.5%) reporting an onset age of <18 years. Concerning the severity of acne; 71 (59.2%) were graded as mild, 38 (31.7%) patients as moderate and 11 (9.2%) as severe; as illustrated in table (3).

Table 3: Clinical characteristics of acne.

Sociodemographic characteristics	Frequency (N=120)	Percentage (%)
Age of onset		
<18 years	105	87.5
≥18 years	15	12.5
Severity of acne		
Mild	71	59.2
Moderate	38	31.7
Severe	11	9.1

Association of certain factors with the severity of acne: No significant association was found between the severity of acne and each of the following risk factors: smoking, cosmetic use, milk or diary consumption, spicy diet, fatty diet and family history. Whereas higher severity was significantly associated with sugar consumption, stress, and more hours of sunlight exposure; as illustrated in table (4).

Table 4: Association of certain risk factors with the severity of acne.

Risk factors	Severity			P value
	Mild	Moderate	Severe	
Smoking				
Positive	4	2	0	1.000
	5.6%	5.3%	0.0%	
Negative	67	36	11	
	94.4%	94.7%	100.0%	
Stress				
Positive	30	22	9	0.025
	41.7%	57.9%	81.8%	
Negative	42	16	2	
	58.3%	42.1%	18.2%	
Cosmetic				
Positive	11	7	2	0.934
	15.5%	18.4%	18.2%	
Negative	60	31	9	
	84.5%	81.6%	81.8%	
Milk or dairy products consumption				
Positive	44	18	9	0.112
	62.0%	47.4%	81.8%	
Negative	27	20	2	
	38.0%	52.6%	18.2%	
Sugar consumption				
Positive	13	24	9	<0.001
	18.3%	63.2%	81.8%	
Negative	58	14	2	
	81.7%	36.8%	18.2%	
Spicy diet				
Positive	34	22	9	0.091
	47.9%	57.9%	81.8%	
Negative	37	16	2	
	52.1%	42.1%	18.2%	
Fatty diet				
Positive	30	22	8	0.104
	42.3%	57.9%	72.7%	
Negative	41	16	3	
	57.7%	42.1%	27.3%	
Family history				
Positive	59	32	11	0.464
	83.1%	84.2%	100.0%	
Negative	12	6	0	
	16.9%	15.8%	0.0%	
Hours of sunlight exposure				
Mean ± SD	1.5 ± 1.3	2.3 ± 1.7	3.8 ± 1.3	0.01

Association between severity of acne and BMI: Statistical analysis revealed no significant association between the severity of acne and BMI (p value = 0.620); as shown in table (5).

Table 5: Association between severity of acne and BMI.

BMI	Severity			Total	P value
	Mild	Moderate	Severe		
Underweight	9	8	3	20	0.620
	12.7%	21.1%	27.3%	16.7%	
Normal weight	50	21	6	77	
	70.4%	55.3%	54.5%	64.2%	
Overweight	8	7	2	17	
	11.3%	18.4%	18.2%	14.2%	
Obese	4	2	0	6	
	5.6%	5.3%	0.0%	5.0%	
Total	71	38	11	120	
	100.0%	100.0%	100.0%	100.0%	

Discussion

In the present study, the mean age of acne onset was 15 years. This is expected given that the since the incidence of acne is most prominent among those aged 15-17 years and diminishes with increasing age. The current study has also demonstrated that most cases of acne were of the mild group; followed by the moderate and severe groups. In discordance to this finding; Lajevardi et al. reported that most acne cases were moderate, followed by mild and severe cases. [12]The correlation between obesity and the extent of acne is a subject of debate within academic circles. The presence of hyperandrogenism, which is facilitated by obesity, might contribute to the exacerbation of acne vulgaris. According to the research conducted by Alan et al., an elevated body mass index (BMI) is associated with the development of hyperandrogenism and the exacerbation of acne vulgaris. [13] Due to similar rationales, the revised therapeutic guidelines for acne vulgaris suggest the use of several contraceptive tablets that inhibit androgenic activity. On the other hand; certain studies declined a relationship between acne and excessive production of androgen. [14] The findings of the present study did not provide evidence to support the notion that there is a relationship between body mass index (BMI) and the severity of acne. This is in concordance with other studies; such as Lajevardi et al., Borgia et al., and Wolkenstein et al. [12, 15, 16] Contrary to our research findings, Sas et al. conducted a study including 143 teenagers and concluded that there was a significant association between higher BMI and the severity of acne, however no ignificant relationship was observed with its prevalence. [17] In the study conducted by Hasrat et al. in Basrah, it was observed that patients with severe acne had a notably higher body mass index (BMI) compared to those with mild or moderate acne. The mean BMI values were found to be 21.8 Kg/m2 for the mild acne group, 22.6 Kg/m2 for the moderate acne group, and 30.5 Kg/m2 for the severe acne group. [18] Surprisingly, Snast et al. reported that higher BMI was associated with lower prevalence of acne. The authors argued that the potential rationale behind the protective influence of elevated BMI on acne may be linked to the heightened aromatase activity and peripheral conversion of androgens to estrogens generated by excessive adipose tissue. [19] The precise mechanism remains uncertain, but it is established that estrogens have the ability to reduce sebum production and counteract the impact of androgens on the sebaceous glands. And so, estrogens may have a protective function in preventing acne. [20] The present investigation revealed a lack of statistically significant correlation between smoking behavior and the extent of acne severity. A comparable observation was documented by Mariana et al. [21] Wolkenstein et al. conducted

a study that revealed a noteworthy correlation between smoking and a diminished likelihood of developing acne; suggesting that smoking may have a protective role from acne[16].The primary hypothesis that establishes a connection between different dietary components (such as milk, sugars, and fats) and acne proposes that these factors lead to hyperinsulinemia. This, in turn, sets off a series of hormonal events, including elevated levels of insulin-like growth factor-1, disrupted retinoid signaling, and increased androgen production. Consequently, playing a role in the development of acne. [22] The findings of the current study does not confirm this hypothesis regarding sugars, as sugar consumption was significantly linked to the severity of acne. This is in concordance to Lajevardi et al. who also reported that chocolate consumption was the only dietary factor associated with acne, while no association was detected regarding milk and fats. [12] Mariana et al. reported that increased intake of sweets, carbonated drinks and white bread (besides dietary fats) was a predictor of more severe acne. [21] Psychological stress was also a predictor of the severity of acne. This is in concordance with Alrahmani et al., and Yosipovitch et al. [23, 24] Interestingly sun exposure emerged as the only risk factor that exhibited a significant association with the severity of acne in the present study. Given that the study was conducted during summer, this can be attributed to the extremely hot sun in Iraq; Solar light has the potential to increase the production of inflammatory cytokines in sebaceous glands. [25] In a study conducted by George et al., it was shown that among the population of individuals with acne, a notable proportion of 26.4% experienced the development of skin lesions subsequent to exposure to sunlight. Furthermore, it was discovered that seasonal fluctuation had a role in exacerbating the condition in 44.5% of patients, likely due to the heightened levels of sunshine exposure during the summer months[11]. Dreno et al. stated that there was a notable increase in the prevalence of acne among those who had moderate to intense sun exposure as a result of their occupational or everyday activities. [26]

Conclusions

Based on the findings of the present study, BMI was not significantly associated with the severity of acne vulgaris. Among other dietary and lifestyle characteristics, sugar consumption, stress, and increased exposure to sunlight were predictors of severity. However, larger population sized studies are essential to validate these findings.

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