ORIGINAL ARTICLE
Role of Certain Diet and Body Mass Index on Severity of Acne

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ABSTRACT
Introduction: Acne vulgaris (AV) is one of the most prevalent chronic dermatological conditions among adolescents. Recent data indicated that a certain diet may influence the development and appearance of acne.
Materials and methods: This was a cross sectional study conducted in the outpatient department of Erbil dermatology teaching center from May 2022 to December 2022. All the newly diagnosed patients with acne were included in the study. Height and weight of the patients was recorded and BMI was calculated. BMI was categorized as underweight, normal weight, overweight and obese. Type of lesions was noted and severity of acne was graded from 1 to 4.
Result: In this study, 27 patients (27%) were male and 73 patients (73%) were female. The highest rate of AV was seen in age group 16-20years and the lowest rate was observed in age group ≥21 years. Moderate to severe acne was strongly associated with a family history of acne in first-degree relatives (P= 0.0141). There was a significant association between Acne treatment received (<0.0007) and smoking habit (<0.0001) with severity of acne. The risk increased with increased red meat consumption (P= 0.0486). Majority of patients (62%) had normal BMI. Most of the patients had Grade 1 acne (20%). There was no significant association between the BMI and severity of acne (p= 0.3094)
Conclusion: BMI are not risk factors for severity of AV, but a family history of acne is. Severity of AV is related to receiving acne treatment, cosmetic use, smoking habit and red meat
Keywords: Acne vulgaris, family history, age, diet, body mass index

INTRODUCTION
Acne vulgaris is a chronic inflammatory disorder affecting the pilosebaceous units. This condition affects most individuals at some point of their lives, especially during adolescence (1). The age of incidence is between 14 to 17 years in women and 16 to 19 years in men. The incidence of the condition decreases with increasing age (2). It is well known that acne is one of the top three most common skin diseases. Family history of acne has been reported in 62.9% to 78% of patients (3). The development and exacerbation of acne lesions, like other diseases, are affected by the patient's genetic predisposition. However, it is also greatly affected by environmental factors, some of which can trigger the response of acne in some patients. Among many environmental factors, there may be some link between the ingestion of milk and acne, as well as between the eating of high-glycemic-index foods and the subsequent development and result of acne (4). The body mass index (BMI) has been reported to be positively correlated with acne in school children, adolescents and young adults (5). Data for adult women are limited and the relationship between BMI and acne is still controversial (6).

Acne lesions can be classified into a few types – comedones, papules, pustules, nodules, and cysts – based on their size and appearance (7). Comedones are often referred to as "non-inflammatory lesions" while papules, pustules, nodules, and cysts are collectively termed as "inflammatory lesions" due to their red and swollen appearance (8). Based on the acne lesions that an individual present, their acne severity can be broadly classified into three categories – mild, moderate, and severe; milder acne presents with non-inflammatory lesions while more severe acne presents with both inflammatory and non-inflammatory lesions (9). During the healing process of acne lesions, the damaged skin may develop scars (10). The two basic scar types – depending on whether there is a net loss or gain of collagen – are atrophic (majority of scars) and hypertrophic scars and keloids (minority) (11).

Acne mostly affects skin with a greater number of oil glands including the face, upper part of the chest and back (12). Disorders which affect the skin mainly that which taking a chronic form and present on exposed areas of body, may lead to low self-confidence and nervousness symptoms mainly (13). Acne vulgaris has a greater psychological impact on the patient and his/her lifestyle and the resulting appearance may lead to anxiety, reduced self-esteem, and in extreme cases depression and suicidal thoughts (4). The aim of this study is to determine the impact of dietary habit and body mass index on newly diagnosed acne among specific.

PATIENTS AND METHODS
Sampling: At Erbil dermatology teaching center, 100 patients were chosen using the stratified random sample technique, and the study was conducted from May 2022 to December 2022. The family history of acne in the first-degree relatives, if it was positive or negative was recorded. Height and weight were measured. BMI was calculated by dividing weight in kilograms by height in meters squared, or kg/m^2. The World Health Organization Asian Pacifistic Guideline 2000 was followed for categorization of BMI. The patients were classified into one of the following categories: underweight (BMI < 18.5), normal weight (BMI: 18.5– 23.9), overweight (BMI: 24–26.9) and obese (BMI ≥ 27) (14).
Inclusion criteria: Involving subject between 10 to 25 years old group regardless of their gender
Exclusion criteria: Those that received treatment for acne
Data collection: The collection of data was done through direct interview in consultancy clinic of dermatology center with each patient and filling a prepared questionnaire. The patient's was investigated one-week nutritional history and questioned them regarding the impact of various dietary components on acne. The effect was defined as increased the acne nodules and/or severity. Informed consent was obtained from each patient. The demographic questionnaire information included gender, age, residence and occupation. As well as, the clinical information including types, complications and duration of acne, dietary items effect: Like milk, diary product, Bread, Chocolate, fruits, nut, fish and red meat. The effect of each item was described by the patient as increasing the acne nodules and/or severity.

The examination of the patients included the face, chest and upper back regions. The acne severity was assessed using Global Acne Grading (GAG) System [(mild (1-18), moderate (19-30) was (several comedones, papules, pustules and few to several nodules), severe (31-38) was (numerous comedons, papules, pustules and many nodules) and very severe >39] (15, 16).
Statistical analysis: The data was cleaned by removing any invalid or inconsistent responses. The data will be analyzed using appropriated statistical methods which is Chi-squared test by using the prism (graph pad (6.1)). A P-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION
The data obtained from patients were analyzed and the distribution of their demographic and socioeconomic characteristics is described in Table 1. Of the 100 patients 27 were males and 73 were females. The result agreed with (17) which revealed that, a

total of 2,476 participants, 681were males versus 1,795 females. Additionally, (9) showed that, gender of acne patients was not associated significantly with acne complications (p=0.7). The majority of complicated cases were females 32 (49.2%) and the lowest rate was found in male which were 21(46.7%). As well as, (18) in Sohag, Upper Egypt there was female predominance among their cases (1.53: 1). In a study conducted in Nigerian adolescents with acne by Yahya Hospital 50.8 % were males while 49.2% were females (19). Acne vulgaris is one of the most common skin disorders affecting up to 80% of the world population at least during their pubertal years, leading to significant psychosocial effects including depression and poor personality development, especially in female adolescents. This may be due to hormonal changes during menstruation or higher level of stress among females (20).

The age range of participants was 10–27 years (median = 18.18, SD = 3.436,). The study population was divided into three age groups and the maximum numbers of patients are in the age group 16-20 years with a maximum percentage of 49% and the minimum numbers of patients was found in age group 10-15 years with 25 (25%). The result agreed with (14) which expressed that, the highest rate was found in age group 11-20 years and the lowest rate was found in 0-10 years. Acne vulgaris is prevalent among teenagers (11-20years). It is one of the most common skin disorders affecting mostly the adolescent age group that frequently continues into adulthood. Stress and dietary factors are important risk factors of acne (13).

The majority of the acne cases were found in urban (68%) and the lowest rate was revealed in rural area which was (32%). Patients were grouped into five occupations. Students, shows the highest rate of frequency 73%, followed by housewife (19%) and the lowest frequency was seen in government employment and jobless which were 2%. The result agreed with (13) which revealed that, the occupations of cases as student (80%), skilled worker (5.5%), unskilled worker (6%) and non-worker (8.5%) compared to (84%, 4.5%, 5.5% and 6%) of control group respectively. As well as, (21) reported that, the occupation results housewife, student and does not work 41%, 26.6 and 22% respectively. Factors such as socio-economic status, educational level were investigated with respect to acne scarring. No association was found, which may be due to the homogeneity of the population that made up the sample (22).

Table 1: Table 1: Socio-demographic characteristic of patients according to the Acne vulgaris

Variable		Total	Percentage (%)
Gender	Male	27	27
	Female	73	73
Age	10--15	25	25
	16-20	49	49
	>21	26	26
Residency	Urban	68	68
	Rural	32	32
Occupation	Student	73	73
	Housewife	19	19
	Government Employed	2	2
	Non-Government Employed	4	4
	Jobless	2	2

The risk factors that are associated with acne presentation are showed in Table 2. Familial history of acne was associated with severity of acne (0.0141). The result agreed with (23, 24) which reported that, the acne to be more sever in those who have a family history of acne. (16) Showed that, the prevalence of moderate to severe acne was higher in patients with a positive family history than in those with no family history. Our result as the same of (25) revealed that, a positive family history is associated with higher risk of developing severe acne. A new finding of our work is that the most important family member with acne history to increase the risk of developing moderate to severe acne is the mother (16, 26). Acne history in the father follows, being more

important than acne history in older sisters or brothers. These findings clearly indicate a vertical transmission of a genetic risk factor that may be X-chromosome-linked. Moreover, as the number of affected family members increased, the risk for moderate to severe acne in our pupils grew. (27) Found more severe acne forms in patients with acne history on the mother's side or on both parental sides than in patients with acne history on the father's side only.

There are significant difference were found between use of cosmetic and severity of acne (0.0067). the result agreed with (4) which showed that, cosmetic-induced acne is an important concern in some females as many cosmetic products are comedogenic. (28) Reported that, 43.5% patients reported aggravation of acne with use of cosmetics. In other study (29) expressed that, 44 (40%) patients reported aggravation of acne after using some form of cosmetics of which 27 (24.5%) experienced flare after applying skin-lightening agents, 16 (14.5%) patients after doing facial, and 10 (9.1%) after oil application. Conversely, in the study population of (30) showed that, 63.5% adults reported regular use of cosmetics, of which only 22.4% associated them with clinical worsening. Hence, cosmetic-aggravated acne is an important cause of acne in adult females. Patients with treatment-failure history showed that cosmetics affected acne more significantly than with treatment-naïve patients. These acne patients also recognized that cosmetics are associated with acne exacerbations, but in the actual use pattern of cosmetics, treatment -failure patients used more colored types of makeup. The use of foundations, compact foundations, cushions (liquid foundation contained on sponge), concealers, and blushers was more common for patients who failed treatment. Treatment failure patients are aware of the influences of cosmetic use, but paradoxically increasing the use of cosmetic products to cover acne lesions—also, this increased double-cleansing (4, 31). Eighty two patients (82%) had a no medical history of acne and 18 patients (15%) had a positive medical history of acne. As revealed in our result (table 2), there was a significant difference were found between receiving treatment of acne and the severity of acne patients. The highest rate was found in cases which are not used treatment (56%) followed by tropical use which were (36%) and the lowest rate was found in systemic treatment which was (8%). The result agreed with (32) which revealed that, treatments in acne target one or more of the known mechanisms involved in the disease. Combining more than 1 treatment frequently yields optimal responses. Patients may require adjustment of therapies depending on their degree of improvement and level of tolerance to the treatments. (33) Reported that, acne treatment is to control and treat existing acne lesions, prevent permanent scarring as far as possible, limit the duration of the disorder and to minimize morbidity. The patient should be informed that to prevent new acne lesions while allowing the existing ones to heal (34, 35).

Of the lifestyle factors evaluated, smoking habits affected acne severity risk. Interestingly, a few of the smoking variables studied were associated with reduced risk for more severe acne. Higher risk for moderate-severe acne was observed in individuals without paternal (36). The study of (26) showed acne to be more frequent and severe among smokers, and to follow a dose-dependent association. In contrast, in the study of (37), active smokers had a significantly lower prevalence of severe acne with an inverse dose-dependent association. On the other Hand, (38) concluded that smoking is likely to bear a positive correlation with acne for men. (26) Reported a dose dependent relationship between acne severity and the quantity of cigarettes consumed daily, which was not affected by gender. 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-smokers (38).

Table 2: Associated Factors with Severity of Acne

Variable		Mild	(%)	Moderate	(%)	Severe	(%)	Total	(%)	P Value
Family History of Acne	No	9	9	17	17	2	2	28	28	0.0141
	Yes	41	41	21	21	10	10	72	72	
Use of cosmetic	No	44	44	30	30	4	4	78	78	0.0067
	Sunscreen	3	3	2	2	3	3	8	8	
	Cleanser	2	2	5	5	4	4	11	11	
	moisturizer	1	1	1	1	1	1	3	3	
History of medical disease	No	44	44	30	30	8	8	82	82	0.8069
	Yes	6	6	8	8	4	4	18	18	
Acne treatment received	No	18	18	30	30	8	8	56	56	<0.0007
	Topical	27	27	7	7	2	2	36	36	
	Systemic	5	5	1	1	2	2	8	8	
Smoking Habit	No	49	49	37	37	4	4	90	90	<0.0001
	Yes	1	1	1	1	8	8	10	10	

Data on dietary habits were obtained from 100 participants. Based on the answers, 65(65%) of patients reported that, they are not drinking milk every day, 32(32%) stated that, the patient was drink whole milk every days, and the lowest rate was found in patients (3%) which drink skim milk. Similarly, dairy products were also consumed by the same frequency. Majority of them took eat more than 500 grams of Bread /Pasta per week which was 47%. (39) Revealed that milk consumption increases the risk of acne and its severity. Milk is a complex fluid composed of several carbohydrates, proteins, and hormones (40-42). In addition, dairy products contain high levels of branched-chain amino acids (BCAAs), such as leucine and palmitic acid, which increase insulin secretion (43, 44). Leucine also stimulates mTORC-1 and SREBP, increasing lipogenesis in the sebaceous glands. Thus, elevated serum BCAA concentrations are related to oxidative stress and inflammation via mTORC-123,32 (20). Chocolate has always been considered as a factor that may contribute to exacerbation of acne, but there is a very limited amount of evidence supporting its negative impact on the skin. Dermatologists often observe that patients have new pimples a few days after ingestion of products containing chocolate. The result agreed with (9) which revealed that, there were no significant association was observed between each of spicy food, fruits, white meat and chocolate with severity of acne vulgaris. Furthermore, (45) reported that, there was no difference in the composition of sebum between two groups was observed and thus no association between consumption of chocolate and aggravation of acne lesions was found. Similarly in a study by (45, 46), revealed that, the effect of chocolate on the skin condition are controversial and inaccurate because of additional milk, sugar, and other ingredient.

The consumption of vegetables, at least 500-1000 gram per week, was a protective factor for acne severity (17). Fruits /Vegetables were also taken by the same frequency by the respondents. Nuts were taken quite often by 43% of respondents. Positive association were observed for red meat (p = 0.0267) with the severity of acne as reported in table 3. (12, 47) investigated an association of diet and acne in a cross-sectional study which revealed that, intake of fresh fruit was significantly associated (p = 0.02) with a lower incidence of acne and Mediterranean diet (which contains a surplus amounts of vegetables and fruits with addition of fish and nuts) was a protective factor in this study. Moreover, as opposite to the previous diet, the western diet and especially fast food have been studied and they showed that these have an aggravating effect on acne. This was attributed mainly to industrially produced trans fatty acids and saturated fats that compose the main bulk of these dietary options (48). Most of our patients which were not eat fish as shown in table 3. (20) Revealed that, regular fish intake has also been reported to reduce acne, as it contains high levels of n-3 eicosapentaenoic acid (EPA), which acts as a competitive inhibitor of the conversion of arachidonic acid (AA) into inflammatory mediators such as prostaglandin E2 (PGE2) and leukotriene B4 (LTB4), reducing acne-associated inflammation. Furthermore, (49), found that, in fish oil, blocks the conversion of arachidonic acid to leukotriene B, a proinflammatory factor that increases the production of sebum. Moreover, omega-3 fatty acids liquefy sebum and increase skin tolerance to bacterial agents. Omega-6 acids have the opposite effect to that of omega-3 acids. They belong to a group of precursors of inflammatory factors. Increasing the supply of omega-6 fatty acids leads to the development of inflammatory factors and, thus, the formation of AV.

The BMI in the study population was within normal 60 (60%). The highest rate was found in mild cases 31% followed by moderate cases which was 25% and the lowest rate was revealed in very severe cases which was 1%. The result agreed with (50) which reported that BMI is not a risk factor for Adult female acne (AFA). Studies of the relationship between BMI and AFA are few. The few studies done are in consonance with our study that, BMI is not a risk factor for AFA and no relationship between acne severity and BMI (23, 51). On the other hand, (52) observed a positive correlation were found between BMI and severity of acne, the groups with higher BMI had severe grades of acne.(53) Observed a significant association on between acne lesion counts and BMI in men aged 18 to 25 years.

Table 3: Association Diet with severity of Acne

Variable		Mild	Percentage (%)	Moderate	Percentage (%)	Severe	Percentage (%)	Total	Percentage (%)	P Value
Drinking Milk	No	32	32	29	29	4	4	65	65	0.3426
	whole milk	17	17	14	14	1	1	32	32	
	Skim milk	1	1	1	1	1	1	3	3	
eating diary product(cheese, Yogurt) gm/wk	No	18	18	17	17	3	3	38	38	0.7119
	<250 gm/wk	13	13	15	15	2	2	30	30	
	>250gm /wk	19	19	12	12	1	1	32	32	
Bread /Pasta: gm/wk	No	7	7	4	4	1	1	12	12	0.458
	<250 gm/wk	9	9	7	7	1	1	17	17	
	250-500 gm /wk	8	8	13	13	3	3	24	24	

Variable		Mild	Percentage (%)	Moderate	Percentage (%)	Severe	Percentage (%)	Total	Percentage (%)	P Value
	>500 gm/ wk	26	26	20	20	1	1	47	47	
Chocolate : gm/wk	No	22	22	22	22	3	3	47	47	0.5754
	< 100 gm/wk	7	7	5	5	2	2	14	14	
	> 100 gm/wk	21	21	17	17	1	1	39	39	
Fruits /Vigetables: gm/wk	No	11	11	12	12	2	2	25	25	0.9391
	< 500 gm/wk	13	13	10	10	1	1	24	24	
	500-1000 gm/wk	19	19	16	16	3	3	38	38	
	>1000 gm /wk	7	7	6	6	0	0	13	13	
Nuts	No	31	31	22	22	4	4	57	57	0.4452
	Yes	19	19	22	22	2	2	43	43	
Fish	No	46	46	37	37	5	5	88	88	0.4681
	Yes	4	4	7	7	1	1	12	12	
red meat: gm /wk	No	25	25	13	13	1	1	39	39	0.0267
	<250 gm/wk	17	17	23	23	1	1	41	41	
	250-500 gm /wk	7	7	7	7	3	3	17	17	
	>500 gm/ wk	1	1	1	1	1	1	3	3	
Body Mass index	Under weght (<18.5)	11	11	7	7	0	0	18	18	0.4652
	Normal (18.5-24.9)	31	31	25	25	4	4	60	60	
	Overweight (25 -29.9)	7	7	7	7	1	1	15	15	
	Obese (>30)	1	1	5	5	1	1	7	7	

Table 4: Associated type and colour of skin with severity of Acne

Variable		Mild	Percentage (%)	Moderate	Percentage (%)	Severe	Percentage (%)	Total	Percentage (%)	P Value
Skin Type	Dry	2	2	3	3	0	0	5	5	0.9519
	Oily	42	42	36	36	6	6	84	84	
	Combination	6	6	5	5	0	0	11	11	
Skin Color	II	14	14	19	19	4	4	37	37	0.2551
	III	28	28	18	18	2	2	48	48	
	Iv	8	8	7	7	0	0	15	15	

According to table 4, it was found that the patients with oily skin suffered from acne vulgaris (84%) followed by combination skin which were (11%) and the lowest rate was found in dry skin (5%). The result agreed with (54) which revealed that, the most commonly observed skin type on samples is oily skin (79,6%). The amount of sebum production is stated to be linear to the characteristics of oily skin where the skin with high sebum production is observed as oily skin and vice versa. The increased sebum production may be affected by hormones. The higher of androgen hormone is, the higher the sebum production will be as the androgen hormone is suspected to affect the keratinization process (55). The increased sebum production and abnormal keratinocyte proliferation could result in obstruction of ducts and primary acne lesions as microcomedones. On the other side, the elevated sebum could lead to the colonization of C. acnes which in turn worsen acne vulgaris (56). There was no significant difference were found between both black and white patients. The pathophysiology of acne is not thought to differ by race and ethnicity (57). Sebum production has not been shown to be significantly different in black and white skin (57, 58). Examined the histopathology of facial comedonal, papular, and pustular lesions from 30 black females and found marked inflammation in all lesions that was out of proportion with the clinical presentation. The authors commented that this inflammation may help to explain the higher incidence of post inflammatory hyperpigmentation in skin (59). The pathogenesis of acne vulgaris in skin of color most likely involves the same factors as in white skin. abnormal follicular keratinocyte desquamation, leading to the formation of a follicle plug; increased sebum production within the pilosebaceous follicle; the proliferation of the microorganism Propionibacterium acnes in the sebum; and inflammation (60, 61).

CONCLUSION

Acne vulgaris is prevalent among females and the familial history of acne was associated with severity of acne. There are significant difference were found between use of cosmetic and receiving treatment with severity of acne. Smoking habits are important risk factors of acne. Furthermore, there were a Positive association were observed for red meat (p = 0.0267) with the severity of acne. Although there was proportion of patients who were underweight, normal, overweight or obese in almost all the grades of acne, there was no significant association between BMI and severity of acne. it was found that the patients with oily skin suffered from acne vulgaris (84%) followed by combination skin which were (11%) and the lowest rate was found in dry skin (5%). There was no significant difference were found between both black and white patients.

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