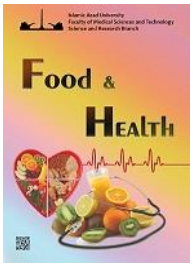

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Relationship between consumption of different food groups, diet quality index, and anthropometric indices with acne in adolescents

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ABSTRACT

Acne vulgaris is a prevalent skin disorder that affects millions of teens and young adults worldwide, but its link to dietary intake is still unclear and requires more research. This cross-sectional study investigated the relationship between diet and acne among 150 adolescents aged 12-18 in Tehran province. The participants reported their dietary intake using a 24-hour recall method. Their anthropometric data were measured using standard methods. Their acne severity was assessed using the Global Acne Scoring System (GAGS). Their diet quality was evaluated using the International Diet Quality Index (DQI-I) based on Kim et al. 2003. The mean GAGS scores for the whole sample and girls and boys were 9.24±8.9, 8.79±8.9, and 9.7±7.13, respectively. The prevalence of acne was 71.5% for the whole sample, 93.3% for boys, and 69.1% for girls. The mean DQI-I score for the whole sample was 48.54. The regression analysis showed no association between acne severity and DQI-I score, food groups, or micro and macronutrients. This study found no evidence of a connection between diet quality and acne among adolescents. Further prospective studies are needed to verify or refute this finding.

1. Introduction

Acne is one of the most common skin disorders, especially among teenagers. This disease is characterized by the formation of pimples, blackheads, whiteheads, and cysts on the face, chest, back, and shoulders. Acne occurs when the sebaceous glands, which produce oil to lubricate the skin, become inflamed and clogged with dead skin cells and bacteria (1). The prevalence of acne varies widely across different countries and regions. In America and Iran, for example, acne affects 50% to 90% and 78% to 91% of the population, respectively (2). Acne can have a negative impact on the psychological well-being and quality of life of the affected individuals. It can lower their self-esteem and connfidence, and increase their risk of developing depression, anxiety, stress, and suicidal thoughts (3). The causes of acne are complex and multifactorial. Some of the most important factors that influence its development and severity are genetic, environmental, psychological, and dietary factors (4). In recent years, there has been a growing interest in exploring the role of diet in acne. Several studies have been published that examine the association between acne and various aspects of dietary intake, such as food consumption, food groups, macro and micro-nutrients, indicators of diet quality, and different dietary patterns (5). The results of these studies are inconsistent and sometimes contradictory. Some studies have found a positive relationship between dairy consumption and acne, suggesting that dairy products may stimulate hormonal activity and inflammation, contributing to acne (7). However, some studies have also reported a positive relation between very low-fat dairy and acne, implying that other components of dairy products besides fat may be involved (7). Similarly, some studies have found a positive relationship between carbohydrate consumption and fat intake and acne, indicating that these nutrients may increase insulin levels and sebum production that promote acne (8). On the other hand, some studies have found no relation between carbohydrate intake and acne, suggesting that other factors may modulate the effect of carbohydrates on acne (8). Other studies have linked healthy eating patterns (fruits, vegetables, and fish) and fatty-sweet

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food (chocolate) to reducing and increasing the risk of acne, respectively (9). These studies imply that antioxidants, anti-inflammatory compounds, and omega-3 fatty acids in fruits, vegetables, and fish may protect against acne. At the same time, chocolate's saturated fat, sugar, and caffeine may aggravate acne (9). However, some studies found that the pattern of animal food and refined grains (meat, milk, and refined grains) was unrelated to acne (8). This suggests that the quality and quantity of these foods may matter more than their presence or absence in the diet. Another study found that the Mediterranean diet, which is rich in fruits, vegetables, whole grains, legumes, nuts, olive oil, fish, and moderate amounts of dairy products and wine, was associated with a reduced risk of acne (8). This study implies that the overall balance and diversity of foods in the diet may benefit acne. Due to the contradictory information available from different studies on diet and acne, this study was conducted to investigate the relationship between DQI-I (Diet Quality Index-International) and acne in adolescents. DQI-I is a comprehensive indicator that measures various aspects of diet quality based on dietary guidelines from different countries.

2. Materials and methods

This cross-sectional study was conducted on 150 adolescents aged 12 to 18 (average age of 14.8 years) living in Tehran province. The study protocol was reviewed and approved by the University Ethics Committee before the start of the study. Informed consent was obtained from all participants or their legal guardians. All participants were selected by simple sampling, meaning they were chosen randomly from a list of eligible individuals. Individuals were excluded from the study if they had any of the following conditions: taking steroid drugs, which may affect hormonal levels and skin health; following weight loss or weight gain plans, which may alter dietary intake and nutritional status; or having diabetes or thyroid disease, which may interfere with metabolic and hormonal functions. At the beginning of the study, all individuals were examined by a dermatologist and their acne status was assessed based on the number and type of lesions on their face and body. Then, height and weight were measured using a stadiometer and a digital scale, respectively, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. The waist and hip circumference were measured using a flexible tape measure at the narrowest part of the waist and the widest part of the hips, respectively. Demographic questions, including age, marital status, gender, family history of acne, cream used for acne treatment or prevention, and education level, were asked using a self-administered questionnaire.

3. Results

There was no significant difference in acne status by gender, income level, marital status, family history, or physical activity. In girls and boys, the mean acne scores in the total population were 9.24±8.9, 8.79±8.9 and 8.7±27.13, respectively. Also, the prevalence of acne in the total population, in boys and girls, was 71.5%, 93.3% and 69.1%, respectively. These results are shown in Table 1.

Table1. Determination of acne status based on demographic variables

Variables	Acne condition					P value*
	Does not have N= 43	Mild N=43	Intermediate N=82	Extreme N=0	Too extreme N=0	
Age, yr	14.7 ±4.9	14.7 ±3.7	14.9 ±1.1	0	0	0.98
Weight, kg	53.6 ±13.7	57.4 ±12.8	54.6 ±10.2	0	0	0.25
Height, cm	159.7 ±8.6	161.0 ±8.5	162.7 ±7.0	0	0	0.39
BMI kg/m^2	20.8 ±4.0	22.0 ±4.2	20.7 ±3.8	0	0	0.15
Waist size, cm	62.1 ±20.0	62.9 ±19.0	63.5 ±17.6	0	0	0.96
Hip size, cm	74.0 ±26.9	74.9 ±26.0	78.1 ±22.4	0	0	0.86
Gender, number (percentage)						
Male	1 (6.7)	11 (73.3)	3 (20)	0	0	0.14
Female	42 (30.9)	71 (52.2)	23 (16.9)	0	0	
Income						0.85
Under 2 million	3 (21.4)	7 (50.0)	4 (28.6)	0	0	
2 to 4 million	19 (26.0)	41 (56.2)	13 (17.8)	0	0	
4 to 6 million	11 (32.4)	19 (55.9)	4 (11.8)	0	0	
Above 6 million	10 (33.3)	15 (50.0)	5 (16.7)	0	0	
Marital status (single)	42 (28.6)	79 (53.7)	26 (17.7)			0.59
Nerve agent (no)	41 (28.3)	79 (54.5)	25 (17.2)			0.95
Physical activity						0.53
Less than half an hour a week	7 (25.9)	16 (59.3)	4 (14.8)	0	0	
Less than 1 hour per week	7 (21.2)	22 (66.7)	4 (12.1)	0	0	
Between 2 and 3 hours per week	11 (26.2)	23 (54.8)	8 (19.0)	0	0	
More than 3 hours a week	18 (36.7)	21 (42.9)	10 (20.4)	0	0	

Data were analyzed by chi-square test.

Acne status (mild to very severe) was not significantly different in different levels of age, weight, waist and hip circumference, or BMI. However, people with mild acne had the highest BMI (BMI = 22) and those with moderate acne had the most elevated hip circumference (78 cm), which was not significantly different from those without acne or severe acne.

People with varying acne statuses were not very different regarding DQI-I, food intake, or macronutrients. Only people with mild acne received a higher protein content than people with moderate acne and those without acne (p=0.09). The mean score of DQI-I in this study was 48.54. This means that the overall diet quality of the participants was moderate (Table 2). Logistic regression analysis showed that DQI-I, its components, and the percentage of energy from protein, carbohydrates and fats were not associated with acne. This means that none of these dietary factors significantly affected the risk or severity of acne in this study population. These results are shown in Table 3.

Table 2. Determining the status of acne according to the status of food intake.

Variables	Acne condition					P value*
	Does not have N= 43	Mild N=43	Intermediate N=82	Extreme N=0	Too extreme N=0	
Cereal, serving/day	7.7 ±2.6	7.7 ±2.7	7.7 ±3.0	0	0	0.99
Fruit, serving/day	3.43 ±1.8	3.4 ±1.8	4.0 ±1.5	0	0	0.29
Vegetables, serving/day	4.6 ±1.5	4.9 ±2.3	4.6 ±1.9	0	0	0.57
Dairy, serving/day	1.5 ±0.76	1.7 ±0.81	1.6 ±0.79	0	0	0.40
Meats, serving/day	1.3 ±0.61	1.4 ±0.76	1.3 ±0.64	0	0	0.75
Beans, serving/day	0.0 ±0.0	0.0 ±0.0	0.0 ±0.0	0	0	0
Foods containing high calories, kilocalories/day	169.0 ±118.0	144.0 ±103.0	146.0 ±102.0			0.48
Protein %	17.6 ±2.3	18.3 ±3.0	17.2 ±2.2			0.09
Carbohydrate %	56.9 ±4.7	56.6 ±5.6	58.3 ±5.1	0	0	0.35
Fat %	26.9 ±4.1	25.8 ±4.2	25.3 ±5.0	0	0	0.59
DQI-I	48.37 ±5.60	48.43 ±6.0	48.84 ±5.7	0	0	0.47

Data were analyzed by analysis of variance.

Table 3. Determining the relationship between diet quality index, food groups, macronutrients, and micronutrients with acne.

Variables	Odds Ratio (confidence interval)	P value*
DQI-I	(1.07-0.95) 1.00	0.88
Cereal, serving per day	(1.14-0.88) 1.00	0.92
Fruit, serving per day	(1.26-0.84) 1.03	0.78
Vegetables, serving per day	(1.30-0.89) 1.08	0.41
Dairy, serving per day	(2.11-0.81) 1.31	0.27
Meats, serving per day	(1.82-0.65) 1.08	0.25
Beans, serving per day	(0.0-0.0) 0.0	0.0
Foods containing high calories, kilocalories per day	(1.00-0.99) 0.99	0.23
Protein %	(1.25-0.95) 1.09	0.23
Carbohydrate %	(1.07-0.93) 1.00	0.92
Fat %	(1.05-0.89) 0.96	0.36
Vitamin A	(1.00-0.99) 1.00	0.64
Vitamin B1	(6.10-0.48) 1.71	0.41
Vitamin B2	(2.94-0.68) 1.42	0.35
Vitamin B3	(1.06-0.95) 1.00	0.35
Vitamin B6	(2.45-0.54) 1.15	0.71
Vitamin B9	(1.01-0.99) 1.00	0.41
Vitamin B12	(1.36-0.85) 1.08	0.52
Vitamin D	(1.11-0.91) 1.00	0.87
Vitamin E	(1.16-0.76) 0.94	0.56
Vitamin C	(1.03-0.98) 1.00	0.49

Data were analyzed by logistic regression.

4. Discussion

This case-control study evaluated 151 adolescents aged 14.8 years to examine the effects of diet quality profile, food groups, macro- and micronutrients, anthropometric indicators and mental health status on acne. We found no significant differences in acne severity based on age, gender, income levels, marital status, neuroleptic use, family history and physical activity levels. Our findings are consistent with some previous studies (11-14). However, we found that the prevalence of acne in our sample (71.5%) was higher than most reported rates in the literature (15-21), which ranged from 7.3% to 95%. This could be due to other studies' different measurement instruments and methods. Some studies used self-report questionnaires, some used clinical examinations by dermatologists, and some used different scales or criteria to define acne and its severity (15). Using logistic regression models, we also examined the association between anthropometric indicators and acne risk. We adjusted for potential confounding factors such as age, gender and income levels. We found no association between any of the anthropometric indicators and acne risk. This means that these indicators did not affect the participants' likelihood of acne. This agrees with some studies that found no association between anthropometric indicators and acne risk (11, 14-16, 22-24, 30). However, some studies reported conflicting results. Some studies found that higher BMI or obesity increased the risk of acne (17-19, 25-29), while some studies found that lower BMI or underweight increased the risk of acne (22). The discrepancies could be explained by variations in sample size,

age range, gender distribution and confounding factors among different studies. Using logistic regression models, we further investigated the association between mental health variables and acne risk. We adjusted for potential confounding factors such as age, gender and income levels. We found that only anxiety increased the risk of acne among mental health variables. This means that higher anxiety levels increased the likelihood of having acne among the participants. The duration of acne did not affect the anxiety level. This aligns with some studies that found a positive association between anxiety and acne (26). However, some studies did not find any association between anxiety and acne (12-14). The lack of association between stress or depression and acne in our study differs from many studies that found a positive association between these variables and acne (17-19). This could be due to different stress measurement tools or coping strategies among diverse populations. Finally, we analyzed the difference between acne and healthy groups regarding diet quality profile, its components (protein, carbohydrate and fat), and vitamins and minerals intake using independent t-tests or Mann-Whitney U tests depending on the normality of data distribution. We calculated the diet quality profile using the Healthy Eating Index (HEI), which measures how well a diet conforms to dietary guidelines. We found no difference between acne and healthy groups in terms of any of these nutritional variables. This means these variables did not affect the presence or absence of acne among the participants. This is similar to some studies that also found no difference between acne and healthy groups in terms of these dietary variables (1, 4, 11-14). However, some studies reported different results. Some studies found that certain foods or nutrients increased or decreased the risk of acne (3-10). Some studies examined food patterns or nutrition indicators instead of specific foods or nutrients (3-5). These patterns can show how well people eat overall. Our results are similar to some studies that also found no difference between acne and healthy groups in terms of food patterns or nutrition indicators (11-14). However, some studies reported different results. Some studies found that specific food patterns or nutrition indicators increased or decreased the risk of acne (35-37). The conflicting results could be due to different dietary assessment methods or food composition databases used in different studies.

5. Conclusion

This cross-sectional study examined the association between acne and various factors in 150 people aged 12 to 18. The results showed that only anxiety was significantly related to acne. Diet quality profile, as well as individual food components, were not associated with acne. Moreover, height, weight, BMI, waist circumference, hip circumference, depression and stress were unrelated to acne. In general, the diet quality score in this population was deficient, which suggests the need for interventions to improve adolescent food intake. This study provides insights into the role of psychological factors in acne development and highlights the importance of mental health care for adolescents with acne.

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