

NUTRITION AND ACNE: EXPLORING THE CONNECTION

Vanya Birdanova^{1*}, Preslav Vasilev², Ivelina Ruseva, Ivelina Yordanova², Iveta Petrova, Valentina Kozova³

¹Department of Hygiene, Medical Ecology, Occupational Diseases and DM, Faculty of Public Health, Medical University–Pleven, Bulgaria

²Department of Dermatology and Venereology, Faculty of Medicine, Medical University–Pleven, Bulgaria

³Department of Medical-diagnostic Activities, Medical College, Medical University–Pleven, Bulgaria

Abstract. *Acne vulgaris is a persistent inflammatory skin condition affecting the pilosebaceous unit. Its development involves a combination of factors, including increased sebum production, altered keratinization, microbial colonization by Cutibacterium acnes, and inflammation. Additional contributors include hormonal changes, genetic predisposition, stress, and dietary habits. Foods with a high glycemic index, dairy products, and energy-dense meals may influence acne severity, particularly in Western-type diets. This study examined the relationship between acne severity and dietary habits among 46 Bulgarian women aged 14–40 years. Acne severity was graded using the Global Acne Grading System (GAGS), and diet was assessed through a Food Frequency Questionnaire (FFQ). Lower daily consumption of antioxidant- and fiber-rich foods (fruits, vegetables, whole grains, and legumes) was observed. Acne severity showed a significant negative correlation with nut intake ($r = -0.51$; $p < 0.05$) and positive correlations with milk ($r = 0.46$; $p < 0.043$), sugary foods and honey ($r = 0.61$; $p < 0.016$). Frequent consumption of sunflower oil, processed meats, and beer was more common among participants with severe acne. These findings suggest that energy-dense foods rich in fats and sugars, as well as milk and alcohol, may exacerbate acne development in young women.*

Keywords: *acne, diet, dietary habits, glycemic index, milk, nutrition, young women*

1. INTRODUCTION

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit that affects up to 85% of adolescents and a substantial number of adults—particularly female—worldwide. Its pathogenesis involves excessive sebum production, abnormal follicular keratinization, Cutibacterium acnes colonization, and the release of pro-inflammatory mediators [1]. Although genetic predisposition is an important factor, environmental and lifestyle determinants—particularly diet—play an increasing role in acne onset and severity [2,3,4]. Nutrition has been identified as a modifiable risk factor that influences hormonal and inflammatory mechanisms affecting sebaceous gland activity and keratinocyte proliferation. High-glycemic index (GI) foods and dairy products are the most consistently linked dietary factors [5,6]. High-GI diets elevate insulin and insulin-like growth factor-1 (IGF-1), stimulating sebum production and androgen activity. Milk proteins also raise IGF-1 and may contain hormones that exacerbate acne. In contrast, diets rich in omega-3 fatty acids, zinc, vitamin D, and antioxidants exhibit anti-inflammatory and sebostatic effects, potentially reducing acne severity [7,8]. Nevertheless, findings remain inconsistent due to genetic, dietary, and methodological differences. Given the limited data from Eastern European populations, this study aimed to investigate the relationship between dietary patterns and acne

severity among young Bulgarian women aged 14–40 years. Understanding these associations could help develop targeted nutritional strategies as adjunctive therapy in acne management.

2. MATERIALS AND METHODS

A cross-sectional observational study was carried out between September 2024 and March 2025. The study population consisted of female patients diagnosed with Acne Vulgaris who voluntarily agreed to participate after providing written informed consent. Participants were recruited from outpatient clinics in Dermatology, Obstetrics and Gynecology, and Endocrinology, Pleven region, Bulgaria. The inclusion criteria were: female sex, age between 14 and 40 years, confirmed diagnosis of Acne Vulgaris, and no systemic dermatologic treatment within the preceding three months.

Acne severity was assessed by a dermatologist using the Global Acne Grading System (GAGS) according to the method of Doshi et al. [9]. The GAGS classifies acne severity as mild (1–18 points), moderate (19–30 points), severe (31–38 points), and very severe (>39 points).

Dietary intake of various foods and beverages was evaluated using the Food Frequency Questionnaire (FFQ) method. The Questionnaire consisting of food and beverage items, categorized as follows: carbohydrate-rich foods (grains, potatoes, sweets,

* E-mail of the corresponding author: vania62@gmail.com

honey), dairy products (milk, yogurt, cheese, cottage cheese), fruits and vegetables, fats and oils, protein sources (meat, fish, eggs, legumes, nuts), and beverages (tonic, non-alcoholic, and alcoholic). Participants indicated the usual frequency of consumption over the previous year using one of seven response options: more than once per day, once daily, 5–6 times per week, 2–4 times per week, once weekly, 1–3 times per month, or less than once per month. Dietary intake was assessed by transforming the reported consumption frequency using the recommended amounts (standard portions in grams or milliliters) specified in the national dietary guidelines for healthy eating across different age groups [10,11].

Body composition was measured by Tanita MC – 780MA-N and software Mobee 360 version 4.6.4.0. Height was assessed with participants standing upright, using a portable stadiometer, and recorded to the nearest 0.1 cm.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software (v. 26.0). Descriptive data are presented as mean values with standard deviations (mean \pm SD). The Pearson chi-square (χ^2) test was applied to evaluate categorical variables. Non-normally distributed variables were analyzed using the Mann–Whitney U and Kruskal–Wallis tests, while those following a normal distribution were examined using the independent samples t-test and analysis of variance (ANOVA). All analyses were performed at a 95% confidence interval, and p-values below 0.05 were considered statistically significant.

3. RESULTS

A total of 46 women participated in the study, with a mean age of 24.8 years \pm 7.8 years (median: 23 years). In the sample, approximately half of the participants presented with mild (28.3%) and moderate (36.9%) forms of acne. About one-quarter were classified as having severe acne (23.9%), while 10.9% had very severe acne. Significant age-related differences were observed; mild acne was more common among women over 30 years of age, whereas very severe acne predominantly affected girls under 18.

No statistically significant differences were found in body mass index (BMI) and body composition parameters among the different degrees of acne severity, except for the phase angle (PhA), which is an indicator of cellular health (Table 1).

The results show that the total intake of complex carbohydrates (grains and potatoes) was below the recommended levels for healthy eating and did not differ significantly between the acne severity groups. Consumption of confectionery products and honey was higher among individuals with more severe forms of acne and showed a significant positive correlation with disease severity ($r = 0.61$, $p < 0.016$).

A similar positive association was observed between milk and dairy product intake and acne

Table 1 Age, body mass index, and body composition characteristics of the study group - (mean \pm SD)

Parameters	Mild (n=13)	Moderate (n=15)	Severe (n=11)	Very Severe (n=7)	P values
Age (years)	37,8 \pm 7,1	21,8 \pm 5,1	24,6 \pm 6,4	16,1 \pm 1,9	0,001**
BMI (kg/m ²)	23,03 \pm 2,5	21,3 \pm 2,7	22,9 \pm 4,2	23,2 \pm 0,9	0,66
Fat mass (%)	27,4 \pm 4,7	26,3 \pm 4,5	27,4 \pm 6,6	27,7 \pm 3,7	0,97
Fat free mass (kg)	44,5 \pm 4,3	41,7 \pm 5,5	43,5 \pm 5,7	40,9 \pm 3,7	0,75
PhA	5,5 \pm 0,4	5,3 \pm 0,5	5,2 \pm 0,6	5,0 \pm 0,8	0,001**

severity ($r = 0.46$, $p < 0.043$), with participants with severe acne consuming significantly more fresh milk.

No significant differences were found in the consumption of fresh fruits and vegetables; however, individuals with more severe acne more frequently consumed canned vegetables and sweetened fruit juices.

A negative correlation was identified between acne severity and nut consumption ($r = -0.51$, $p < 0.05$), suggesting a potential protective effect of these foods. Fish and legume intake was markedly below recommendations for all participants.

Individuals with mild forms of acne consumed significantly more poultry and eggs, whereas those with severe forms consumed significantly more red meat. The consumption of processed meats was high across all study groups.

No differences were found in the intake of butter, margarines, and vegetable oils, except for the more frequent consumption of sunflower oil among participants with very severe forms of acne. Participants with more severe acne also reported higher beer consumption ($p = 0.04$) – (Table 2).

Table 2. Food consumption and acne severity

Foods/ Acne severity	Mild/ Moderate acne n=28	Severe/ Very severe acne n=18	P values
Whole grain bread	117,9 \pm 133,2	85,1 \pm 107,5	0,450
White bread	61,6 \pm 85,2	33,6 \pm 81,7	0,08
Potatoes (boiled or baked)	73,4 \pm 31,7	47,3 \pm 35,6	0,008**
Potatoes (French fries or chips)	20,8 \pm 23,2	38,7 \pm 41,4	0,07
Rice	15,8 \pm 23,8	8,8 \pm 10,4	0,186
Vegetables	274,8 \pm 144,7	262,5 \pm 162,8	0,86
Canned vegetables	282,5 \pm 139,7	320,3 \pm 235,4	0,43
Fruits	179,7 \pm 81,5	145,85 \pm 85,3	0,076
Fruit juice	42,8 \pm 52,3	106,4 \pm 160,2	0,072
Milk	149,9 \pm 109,8	239,6 \pm 136,7	0,017*
Dairy products	35,8 \pm 28,1	33,6 \pm 21,8	0,97
Legumes	2,4 \pm 2,7	1,77 \pm 0,37	0,67
Nuts	24,0 \pm 14,7	5,6 \pm 2,1	0,042*

White meat	81,43±67,4	54,2±48,6	0,033*
Red meat	16,3±15	43,1±68,5	0,048*
Processed meat	49,5±45,3	70,02±88,9	0,36
Fish	23,3±25,3	36,7±75,5	0,48
Eggs	60,0±74,0	28,9±51,1	0,036*
Solid oil	2,53±2,3	2,74±2,75	0,74
Vegetable oil	24,7±14,5	19,6±16,1	0,261
Sweets	11,0±11,9	40,35±44,3	0,016*
Honey	3,5±4,3	3,5±6,5	0,99
Chocolate	17,1±9,4	23,6±21,3	0,37
Sugary soft drink	66,4±102,4	75,0±124,2	0,82
Beer	18,16±10,3	59,2±12,5	0,04*
Wine	12,5±16,2	15,8±31,6	0,056
Spirits	6,1±3,8	5,0±3,1	0,082

4. DISCUSSION

The present study examined the relationship between dietary habits and acne severity among Bulgarian women aged 14–40 years. The results demonstrated significant correlations between higher acne severity and the frequent consumption of milk, sugary foods, and honey, while the intake of nuts showed an inverse relationship. These findings align with previous research suggesting that Western-type diets rich in refined carbohydrates, saturated fats, and dairy products may exacerbate acne through hormonal and inflammatory mechanisms [12,13,14,15].

Milk consumption has been repeatedly associated with increased acne prevalence, possibly due to its influence on insulin-like growth factor-1 (IGF-1) and androgen signaling [16]. The observed positive correlation between acne severity and the intake of sugary foods and honey supports the concept that high-glycemic-index diets elevate insulin levels, stimulating sebaceous gland activity and follicular keratinization [17,18]. Conversely, nuts are rich in omega-3 fatty acids, vitamin E, zinc, and selenium—all of which exert antioxidant and anti-inflammatory effects that may contribute to skin health [19,20].

Interestingly, frequent consumption of sunflower oil, red meat and processed meats, and beer was more common among participants with severe acne. This pattern suggests a broader dietary profile characterized by low nutrient density and pro-inflammatory potential. Such dietary behaviors may also reflect lifestyle factors such as stress and irregular eating patterns, which are independently linked to acne exacerbation [21].

The absence of significant differences in BMI and fat percentage across acne severity groups indicates that body composition alone does not account for the observed associations. This finding reinforces the notion that diet quality, rather than caloric intake or body weight, plays a critical role in acne pathogenesis. However, the significant variation in phase angle (PhA) suggests potential differences in cellular integrity and inflammation that warrant further study.

Limitations of this study include the small sample size, self-reported dietary data, and cross-sectional design, which prevents establishing causality. Future longitudinal studies with larger populations and controlled dietary interventions are recommended to confirm these associations and explore the underlying mechanisms.

Overall, the results emphasize the importance of balanced nutrition—particularly reducing high-glycemic and dairy foods while increasing antioxidant- and fiber-rich plant-based foods—as part of holistic acne management strategies for young women.

5. CONCLUSION

This study demonstrates that the consumption of high-glycemic index foods, dairy products, processed meats, and alcohol is associated with greater acne severity in young women. A dietary pattern low in foods rich in vitamins, fiber, and antioxidants may further contribute to poorer skin condition. These findings highlight the role of diet as a modifiable factor affecting the severity of *Acne vulgaris* and support the inclusion of dietary interventions in prevention and treatment approaches for young individuals.

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