

Dietary Patterns in Patients with Acne Vulgaris and its Association with Acne Severity

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Abstract

Background: Acne vulgaris, commonly known as acne is frequent skin inflammation condition of pilosebaceous unit. Recent studies have reported the role of dietary intake in the onset and severity of acne.

Objective: To compare dietary intake between individuals with and without acne vulgaris and to assess the association between dietary intake and acne severity among patients with acne vulgaris.

Methods: A case control study was conducted in the Department of Dermatology, Bakhtawar Amin Trust Hospital, Multan from September 2024 to February 2025. A total of 120 patients; 60 with acne vulgaris (Group A) and 60 healthy subjects (Group B) were selected for the study. Patients' data was noted by interview consisting of three parts; anthropometric data, 3-day food consumption and consumption of food and dairy products.

Results Group A consumed significantly more cheese than Group B ($p < 0.05$). Acne scores were positively associated to carbohydrate consumption significant ($p < 0.01$) and negatively associated to fat consumption ($p < 0.01$)

Conclusion: Patients with Acne vulgaris have higher odds of cheese consumption. Higher carbohydrate intake correlates positively with acne severity, whereas fat intake showed a negative correlation with acne score.

Key words: Acne vulgaris, diet, fatty acids, food.

Introduction

Acne vulgaris, commonly known as acne is frequent skin inflammation condition of pilosebaceous unit which presents as elevated sebum production and formation of comedones, pustules, nodules, cysts and papules along with hyperkeratinization.¹ The etiopathogenesis of acne is influenced by multiple factors including hormonal imbalance, immunological disorders, genetics and environmental triggers.²

Acne is also an important dermatological condition in Pakistan. A cross-sectional study among 415 medical students in Lahore reported that

58.7% of participants reported having mild acne, demonstrating the substantial burden of acne among young Pakistani adults.³ Another study among undergraduate medical students reported a prevalence of 25%, highlighting variation in reported prevalence according to population characteristics and study setting.⁴ These findings indicate that acne represents a relevant dermatological problem in different Pakistani populations and support further investigation of potentially modifiable factors.

Recent studies have reported the role of food consumption in onset of acne and its severity.⁵ A food rich in carbohydrates elevates androgen levels as a results of increased insulin release and insulin growth factor, inducing hyperkeratinization, cytokines expression and sebum formation.⁶ These proposed mechanisms provide biological plausibility for a relationship between dietary factors and acne but should not be interpreted as demonstrating causation in the present study. Koncara et al reported a positive association between cottage cheese and acne in 50,000 individuals.⁷

However, the relationship between dairy consumption and acne remains controversial. Although several observational studies have reported an association between dairy intake, particularly milk, and acne, other studies have found no significant association or have reported different

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Authors Contribution

MU conceptualized the project. MF & NF did the data collection. MU & MF performed the statistical analysis. NF did the literature search. Drafting, revision & writing of manuscript were also done MU & NF.

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effects according to the type of dairy product consumed.⁸ A systematic review of the available evidence concluded that the relationship between dairy intake and acne may vary according to sex, ethnicity and cultural dietary patterns.⁹ Similarly, a meta-analysis of observational studies reported a positive association between overall dairy and milk consumption and acne, whereas no significant association was observed for yoghurt or cheese.¹⁰ These conflicting findings indicate that the association between individual dairy products and acne remains uncertain and requires evaluation in different populations.

In addition, inflammatory acne was also reported to increase when diet did not include sufficient amounts of omega-3 fatty acids.¹¹ These results were supported by a randomized trial which showed that consumption of omega-3 foods and oral supplementation for 10 weeks significantly reduced acne lesions.¹² Despite the increasing evidence regarding dietary factors and acne, evidence from Pakistan remains limited and is predominantly derived from populations in major urban centers. Southern Punjab has distinct cultural, socioeconomic and dietary characteristics, and dietary patterns may differ substantially from those reported in other Pakistani populations. Therefore, assessment of dietary factors among patients presenting with acne in Multan may provide locally relevant evidence and help determine whether previously reported diet-acne associations are also observed in the Southern Punjab population.

This study was conducted to compare dietary intake between individuals with and without acne vulgaris and to assess the association between dietary intake and acne severity among patients with acne vulgaris.

Methods

A case-control study was conducted in the Department of Dermatology, Bakhtawar Amin Trust Hospital, Multan from September 2024 to February 2025. A total of 120 patients; 60 cases with acne vulgaris (Group A) and 60 healthy subjects (Group B) were selected for the study by consecutive sampling. Sample size was calculated considering a moderate standardized effect size of 0.50, a significance level of 0.05, 95% confidence interval and a statistical power of 80%. Patients were defined as cases if they were diagnosed with acne vulgaris by a dermatologist and healthy individuals without any clinical signs or symptoms of acne vulgaris were defined as controls. Patients taking oral contraceptives, isotretinoin and systemic antibacterials in the last 180 days, patients

diagnosed with diabetes, gastrointestinal disorder or any food allergy, vegetarians and smokers were excluded. All individuals provided their informed consent to become a part of the study.

Potential cases were considered by examining patients presenting at the hospital with complaint of acne. Acne patients were examined by dermatologist before the study to confirm diagnosis through presence of characteristic lesions and severity of acne was graded by Global Acne Grading System.¹³ The assessment was based on examination of the designated facial and truncal regions, with each region evaluated according to the most severe lesion present and the corresponding numerical score. The regional scores were combined to obtain an overall acne severity score, with higher scores indicating greater acne severity. Acne assessment was performed by a dermatologist before dietary data collection. While controls were selected from patients visiting the department for other dermatological conditions and absence of acne was confirmed by initial screening. They were considered eligible controls only if they had no clinical evidence of acne vulgaris and met the same predefined exclusion criteria applied to the acne group. Potential confounding variables including age, sex, body mass index (BMI), and body fat percentage were recorded for all participants.

Patients' data was noted by interview consisting of three parts. The first section included questions about anthropometric measurements such as BMI (calculated by standard formula), weight, height and body fat percentage which were measured by bioelectrical impedance analysis. Baseline weight and height was recorded without footwear and in light clothes.

In second part, participants were questioned about food consumed in 3 days of the last week (2 weekdays and 1 weekend day). Daily consumption of nutrients was calculated by a trained nutritionist using Pakistan Food Composition Tables. Thus, the reported nutrient and energy values represent mean daily intake calculated from the three recorded days, comprising two weekdays and one weekend day, rather than the total three-day intake. Participants reported all foods and beverages consumed during the three recorded days and estimated portion sizes using standardized household measures, including cups, glasses, tablespoons, teaspoons, pieces, slices and other commonly used serving measures. Portion sizes were converted into grams or milliliters for nutrient and energy calculations. For mixed dishes and prepared foods, the reported ingredients and quantities were entered into the dietary calculation

worksheet, and the nutrient contribution of each ingredient was calculated according to the recorded portion consumed. The resulting nutrient and energy values were included in the participant's daily dietary intake. In the last section, frequency of consumption of milk, yoghurt and cheese was recorded to calculate intake of milk and dairy. Since the dietary assessment covered only three days and was performed after acne diagnosis, it was intended to characterize recent dietary intake rather than long-term habitual dietary exposure.

All data was analyzed by SPSS version 24. Data normality was checked by performing Shapiro Wilk test. Mean $\pm$ SD was used to present continuous variables and categorical variables were presented by frequency and percentage. Results of study groups were compared by t-test including age, weight, height, BMI, body fat percentage, and the reported dietary intake variables of cheese, milk, yoghurt, ice cream, carbohydrate, fat and protein. The association of acne score with diet and anthropometric parameters and quantitative variables was assessed by Pearson's correlation test. The primary analyses were comparison of dietary intake variables between participants with acne vulgaris and controls and assessment of the correlation between acne severity score and dietary and anthropometric variables among participants with acne vulgaris. No multivariable regression model was performed to simultaneously adjust for potential confounding variables. Statistical significance was set at a *p* value less than 0.05.

Results

The average age in Group A was 23.51 $\pm$ 5.92 years and in Group B was 25.33 $\pm$ 6.64 years. The study groups did not differ significantly with respect to age and anthropometric parameters (*p* >0.05). The baseline features of both groups are shown in Table-1. Among the 60 participants with acne vulgaris, the distribution of acne severity according to GAGS was mild in 42 (70%) participants, moderate in 15 (25%) participants and severe in 3 (5%) participants.

There was a significant difference between cheese consumption of Group A (1441.12 $\pm$ 990.47 g) and Group B (1044.32 $\pm$ 671.10 g) (*p* =0.022). Cheese consumption was higher among participants with acne than controls (*p* =0.022). Cheese intake also showed a positive correlation with acne score among participants with acne vulgaris (*r* =0.39, *p* =0.01) (Table-2). There were no significant between-group differences in consumption of the individual food products milk (*p* =1.0), yoghurt (*p* =0.58) and ice cream (*p* =0.69). Similarly, no significant between-group differences were observed in the reported proportions of carbohydrate (*p* =0.53), fat (*p* =0.74) or protein (*p* =0.61) (Table-3).

There was a weak but significant positive correlation between acne score and intake of carbohydrates (*p* =0.006). A significant negative correlation was observed between acne scores and intake of fats (*p* <0.001). Higher carbohydrate intake showed positive correlation with acne severity, whereas higher fat intake showed a negative correlation with acne severity among patients with acne vulgaris. Other food consumption had no significant effect on acne severity (Table-2).

Discussion

Many factors contribute to the development of acne vulgaris including diet and sebum production which are correlated.¹⁴ Some foods especially those with high calorie content and carbohydrates are reported to be associated with acne as they facilitate the growth of Cutibacterium acnes and other causative agents of acne.¹⁵ The results of present study showed that higher carbohydrate consumption was positively correlated with severity of acne vulgaris. Sanchez et al also conducted a comparison of effect of low glycemia diet and carbohydrate rich foods in patients in acne which showed that over 10 weeks inflammatory and noninflammatory lesions reduced in low glycemic diet.¹⁶ Raza et al also reported similar results in females aged 15-35 years in 12 weeks trial.¹⁷

Table 1: Baseline features of study groups. (n=120)

	Group A (n=60)	Group B (n=60)	<i>p</i> value
Age in years	23.51 $\pm$ 5.92	25.33 $\pm$ 6.64	0.19
Gender			
Male	15 (25%)	20 (33.3%)	0.26
Female	45 (75%)	40 (66.6%)	
Weight in kg	66.92 $\pm$ 14.77	66.38 $\pm$ 14.63	0.92
Height in cm	165.10 $\pm$ 7.23	165.26 $\pm$ 8.32	0.89
BMI	23.69 $\pm$ 4.64	23.57 $\pm$ 4.11	0.85
Body fat percentage	24.87 $\pm$ 6.40	24.09 $\pm$ 6.62	0.63

*BMI= body-mass index

Table 2: Pearson's correlation between acne score and anthropometric parameters and diet contents. (n=60)

	Pearson's Correlation Coefficient (r)	p value
BMI	0.09	0.41
Body fat percentage	0.07	0.73
Milk	0.07	0.75
Yoghurt	0.10	0.48
Cheese	0.39	0.01*
Ice cream	0.22	0.19
Protein	0.02	0.87
Carbohydrate	0.22	0.006*
Fat	-0.39	0.01*

*significant, *BMI=body-mass index

Table 3: Comparison of consumption of food products and macronutrients intake between study groups. (n=120).

	Group A (n=60)	Group B (n=60)	p value
Food Products			
Cheese (g)	1441.12 ± 990.47	1044.32 ± 671.10	0.022*
Milk (cc)	2635.47 ± 3019.42	2638.78 ± 3585.40	1.0
Yoghurt (cc)	3528.11 ± 3009.52	3840.69 ± 3588.45	0.58
Ice cream (g)	737.47 ± 1098.50	807.34 ± 755.33	0.69
Macronutrients			
Carbohydrate (%)	50 ± 5.8	49 ± 3.5	0.53
Fat (%)	40 ± 4.9	40 ± 2.7	0.74
Protein (%)	11 ± 4.1	11 ± 3.6	0.61

*significant

The observed relationship between carbohydrate intake and acne severity should be interpreted with caution. While our study assessed total daily carbohydrate intake as a macronutrient percentage, we did not evaluate specific glycemic indices or the glycemic load of the foods consumed. Previous literature suggests that rapidly absorbed carbohydrates and high-glycemic foods may play a role in acne pathogenesis by influencing insulin and IGF-1 pathways.¹⁷ Therefore, the carbohydrate association observed in the present study should not be interpreted as indicating that all carbohydrate-containing foods have equivalent effects on acne.

The inverse correlation observed between overall fat intake and acne score should also be interpreted cautiously. Total dietary fat is a heterogeneous category and does not distinguish between saturated, monounsaturated and polyunsaturated fatty acids or between different dietary sources of fat. Consequently, a higher percentage of total dietary fat may not necessarily indicate greater intake of pro-inflammatory fatty

acids. The inverse association may also reflect differences in overall dietary composition, substitution of carbohydrates by fats, or residual and unmeasured confounding. Because the present study did not separately evaluate individual fatty-acid subtypes or establish temporal relationships between dietary exposure and acne severity, the observed inverse association should be considered hypothesis-generating rather than evidence of a protective effect of dietary fat.

Consumption of milk did not have any significant association with acne, however, cheese which is made by milk fermentation, its consumption was significantly higher in acne participants than among controls ($p = 0.022$). A study conducted in Thai adults also reported no correlation between milk and acne.¹⁸ Studies conducted in students and adolescents also agree with our findings.^{19, 20}

The absence of an association between milk consumption and acne in the present study, despite the higher cheese consumption observed among participants with acne, may reflect differences between individual dairy products. Milk and cheese differ in their processing, nutrient composition, protein, fat content and patterns of consumption. In addition, differences in the type of milk consumed, portion size, frequency of intake, dietary background and unmeasured confounding may contribute to the observed discrepancy. Therefore, the present findings should not be interpreted as evidence that milk is protective or that cheese directly causes acne.

Dietary patterns in Pakistan may also influence the relationship between food intake and acne. Previous studies from Pakistan have reported associations between acne and foods such as oily foods, sugar-rich foods, bakery products, fried foods and other high-glycemic dietary items. A Karachi study reported associations between acne and frequent consumption of oily and sugar-rich foods, while another observational study from Karachi reported associations involving dairy products, high-glycemic foods and fatty foods.²¹ These findings suggest that dietary patterns in Pakistani populations may differ from those observed in Western populations.

During fermentation of milk for cheese production, biotransformation of hormone precursors such as androstenedione into testosterone and estrone into estradiol occur, increasing sebum production.⁹ In addition, dairy products even after fermentation have a 3-6 times higher insulin effect although they have a low glycemic index.²² Cow milk has 80% of its protein content consisting of casein which stimulates IGF-1 production and 20% of whey proteins which

stimulates insulin production, playing a part in pathogenesis of acne.²³

Meixiong et al showed that skimmed milk was related to acne more than normal milk.⁹ Whole milk contains more estrogen than skimmed milk so it can cause reduction in acne whereas skimmed milk contains comedogenic hormones.²⁴ Regular intake of large amounts of pasteurized cow milk limits the expression of TGF- β and FOX1 RNA proteins, causing acne is genetically disposed people.²⁵

In contrast to our study, Roengritthidet et al reported a high consumption of milk and ice cream and glycemic load in individuals with acne as compared to controls ²⁶. Similarly, Rygula et al also showed that people drinking 2 or more cups of whole milk everyday had more acne incidence.⁸

The findings of the present study are broadly consistent with previous Pakistani research indicating a possible relationship between dietary habits and acne. In a Karachi-based observational study, dairy products, high-glycemic foods and fatty foods were reported to be associated with acne aggravation.²⁰ Another Karachi study found associations between acne and frequent consumption of oily foods and sugar-rich foods after adjustment for covariates.¹⁷ A randomized controlled study conducted among female acne patients in Lahore also reported improvement in acne-related outcomes following a low-glycemic-load dietary intervention.²¹ However, differences in study design, participant characteristics, dietary assessment methods and definitions of acne severity make direct comparison between these studies difficult.

Our study has some limitations. We only evaluated the overall relationship between fats and acne, while classifying fats into saturated and unsaturated can help better results. Similarly, we only considered the consumption of normal milk but literature has showed the effect of different types of milk on acne differently. Another important limitation is that dietary intake was assessed using a 3-day dietary record after the diagnosis of acne vulgaris. Consequently, the recorded dietary pattern may not reflect habitual dietary exposure before disease onset, limiting causal inference and making reverse causation possible. The present analysis did not include a multivariable model to adjust for these factors simultaneously. Therefore, residual confounding cannot be excluded. Lastly, as the control group was recruited from individuals attending the dermatology department only, they may not fully represent the dietary characteristics of the general population and findings may be influenced by selection bias.

Since the present study used a case-control study design the observed relationships represent associations rather than causal effects. Furthermore, dietary intake was assessed after the diagnosis of acne, raising the possibility of reverse causation whereby individuals with acne may have modified their dietary habits because of their condition. Factors like demographic, lifestyle, dietary and clinical factors may also have influenced the observed associations. Accordingly, the findings should be interpreted as evidence of potential relationships that require confirmation through prospective and interventional studies rather than as evidence that specific foods cause or prevent acne.

Conclusion

Dietary habits may influence the severity of acne vulgaris and support the potential role of dietary assessment as part of acne management. Healthcare professionals may consider providing evidence-based dietary counseling alongside conventional treatment, particularly regarding overall dietary patterns. However, because this study was case-control study and assessed short-term dietary intake after disease onset, causal relationships cannot be established. Longitudinal and interventional studies are needed to clarify whether dietary modification can reduce acne severity.

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Availability of Data: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval: The Ethical Review Committee of Bakhtawar Amin Medical & Dental College, Multan approved the study via letter no. 1816-24/E.C/BAM&DC dated 13/08/2024.

Conflict of Interest: None declared.

References

1. Ogé LK, Broussard A, Marshall MD. Acne vulgaris: diagnosis and treatment. *Am Family Physician* 2019; 100(8): 475-84.
2. Leung AK, Barankin B, Lam JM, Leong KF. *Dermatology: how to manage acne vulgaris*. *Drugs Context* 2021; 10: 2021-8-6.
3. Anaam M. Awareness, beliefs, and self-medication practice of acne vulgaris among medical and pharmacy students in Yemen: A cross-sectional study. *Pharmacy Education* 2025; 25(1): 191-203.

4. Rashid S, Jamil Z, Azeem S, Afzal N. Living with acne: A patient-centered study on myths, beliefs and perceptions. *J Pak Assoc Dermatol* 2023; 33(4): 1314-24.
5. Baldwin H, Tan J. Effects of diet on acne and its response to treatment. *Am J Clin Dermatol* 2021; 22: 55-65.
6. Podgorska A, Puścion-Jakubik A, Markiewicz-Żukowska R, Gromkowska-Kępa KJ. Acne vulgaris and intake of selected dietary nutrients—a summary of information. *Healthcare (Basel)* 2021; 9(6): 668..
7. Koncara FK, Wibowo DA, Riyanto P, Wikanta ER. The influence of cheese consumption on the degree of acne vulgaris in students of medicine faculty of Diponegoro University. *Diponegoro Med J* 2020;9(2): 127-34.
8. Ryguła I, Pikiewicz W, Kaminiów K. Impact of diet and nutrition in patients with acne vulgaris. *Nutrients* 2024; 16(10):1476.
9. Meixiong J, Ricco C, Vasavda C, Ho BK. Diet and acne: A systematic review. *JAAD Int* 2022;7: 95-112.
10. Taha S, Shakhshir M, Zyoud SeH. The mediterranean diet and acne vulgaris: a systematic review and meta-analysis. *Nutr Metab* 2025; 22(1): 132.
11. Balić A, Vlašić D, Žužul K, Marinović B, et al. Omega-3 versus omega-6 polyunsaturated fatty acids in the prevention and treatment of inflammatory skin diseases. *Int J Molecu Sci* 2020; 21(3): 741.
12. Guertler A, Fiedler T, Lill D, Kuna AC. Deficit of Omega-3 Fatty Acids in Acne Patients—A Cross-Sectional Pilot Study in a German Cohort. *Life* 2024; 14(4): 519.
13. Alsulaimani H, Kokandi A, Khawandanh S, Hamad R. Severity of acne vulgaris: comparison of two assessment methods. *Clin Cosmet Investig Dermatol* 2020;13: 711-6.
14. Del Rosso JQ, Kircik L. The primary role of sebum in the pathophysiology of acne vulgaris and its therapeutic relevance in acne management. *J Dermatol Treatment* 2024; 35(1): 2296855.
15. Birdanova V, Vasilev P, Yordanova I, Ruseva I. The relationship between nutritional consumption and acne severity in young adults. *Trakia J Sci* 2025; 23(Supplement 1): 5.
16. Morales-Sánchez MA, Camacho-Rosas LH, García-Becerril I, Peralta-Pedrero ML. Effect of adding a low glycemic load and index diet over 12 weeks in the treatment of moderate acne: a randomized controlled trial. *Int J Dermatol* 2023; 62(1): e39-42.
17. Raza Q, Hina R-e, Nawaz S, Safdar M. Effect of a low-glycemic-load diet and dietary counseling on acne vulgaris severity among female patients aged 15 to 35 years. *Cureus* 2024; 16(11): e72886.
18. Say YH, Heng AHS, Reginald K, Wong YR. Modifiable and non-modifiable epidemiological risk factors for acne, acne severity and acne scarring among Malaysian Chinese: a cross-sectional study. *BMC Public Health* 2021;21: 1-12.
19. Rai FH, Hussain Z, Niazi A, Maqsood M. Assessment of Dietary Habits of Undergraduate Students with Acne: Dietary Habits of Students with Acne. *J Nutr Food Sci* 2023;4(2)16-9.
20. Afnan BH, Asim SA, Amer M, Soomro S. Dietary intake of patients with acne vulgaris in Karachi: an observational study. *J Univ Med Dent Coll* 2021;12(4): 275-82.
21. Zaidi TH, Zafar M, Khoso BK, Ghafoor R. Acne vulgaris and its association with dietary habits at a tertiary care hospital in Karachi, Pakistan. *Ethiopian J Health Sci*; 2023; 33(2): 347.
22. Shkembi B, Huppertz T. Glycemic responses of milk and plant-based drinks: food matrix effects. *Foods* 2023; 12(3): 453.
23. Melnik BC. Lifetime impact of cow's milk on overactivation of mTORC1: From fetal to childhood overgrowth, acne, diabetes, cancers, and neurodegeneration. *Biomolecules* 2021;11(3): 404.
24. Timotius T, Kamalo AJC, Eunike D, Titanic PY, et al. The Relationship Between Protein Whey Milk Consumption and The Occurrence of Acne Vulgaris in Adolescents Aged 18-21 Years. *J Kesehatan* 2023; 14(2): 388-95.
25. Mitchell BL, Saklatvala JR, Dand N, Hagenbeek FALi X, Min JL, et al. Genome-wide association meta-analysis identifies 29 new acne susceptibility loci. *Nature Comm* 2022;13(1): 702.
26. Roengritthidet K, Kamanamool N, Udompataikul M, Rojhirunsakool S. Association between diet and acne severity: A cross-sectional study in Thai adolescents and adults. *Acta DermVenereol* 2021; 101(12): 569.