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Association of dietary patterns with acne vulgaris severity among adolescents: A cross-sectional study.

Dr. R. Meenakshi[1]*, Dr. S. Vasantha Kumari[2], Dr. Prashanthi Mogili[3]
[1]Assistant Professor, Department of Dermatology, Venereology and Leprosy, Government Medical College and General Hospital, Nalgonda, Telangana, India.
[2]Associate Professor, Department of Dermatology, Venereology and Leprosy, Government Medical College and General Hospital, Narsampet, Warangal District, Telangana, India.
[3]Assistant Professor, Department of Dermatology, Venereology and Leprosy, Government Medical College and General Hospital, Janagaon, Telangana, India.

Abstract

Background:
Acne vulgaris is a prevalent dermatological disorder among adolescents, influenced not only by genetic and hormonal factors but also by lifestyle and dietary habits. Identifying modifiable risk factors, particularly dietary patterns, is essential to reducing disease burden and improving quality of life.

Objectives:
To assess the association between dietary patterns and the severity of acne vulgaris among adolescents.

Methods:
A cross-sectional study was conducted among 100 adolescents aged 13–19 years. Data regarding demographic characteristics, dietary patterns, and specific food consumption were collected using a pretested questionnaire. Acne severity was graded using the Global Acne Grading System (GAGS). Dietary intake was classified into traditional, mixed, and Western patterns. Statistical analysis was performed using the chi-square test, with $p < 0.05$ considered significant.

Results:
The study population comprised 42% males and 58% females, with a mean age of 16.2 ± 2.1 years. Acne severity was mild in 34%, moderate in 46%, and severe in 20% of participants. The Western dietary pattern was reported in 41% of adolescents and showed the highest prevalence of moderate (58.5%) and severe acne (29.3%). In contrast, the traditional dietary pattern was associated with a lower prevalence of severe acne (13.6%) ($p = 0.002$). Frequent intake of dairy products (>4 times/week) and sugary beverages (>3 times/week) significantly increased acne severity ($p = 0.03$ and $p = 0.01$, respectively). Conversely, higher consumption of fruits and vegetables (>5 servings/day) was associated with reduced severity ($p = 0.04$).

Conclusion:
Westernized dietary habits, particularly high consumption of dairy and sugary drinks, are significantly associated with greater acne severity among adolescents, while fruit- and vegetable-rich diets appear protective.

Recommendations:
Adolescents should be encouraged to adopt balanced dietary habits emphasizing fruits, vegetables, and whole foods while limiting high-glycemic, dairy, and processed foods.

Keywords: *acne vulgaris; adolescents; dietary patterns; dairy; Western diet; fruits and vegetables*
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Corresponding Author: *Dr. R. Meenakshi*
Email: ***drmeenakshim7@gmail.com***
Assistant Professor, Department of Dermatology, Venereology and Leprosy, Government Medical College and General Hospital, Nalgonda, Telangana, India.

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Introduction

Acne vulgaris is one of the most common dermatological conditions in adolescence, affecting nearly 80% of teenagers worldwide. It is a chronic inflammatory disorder of the pilosebaceous unit, manifested by comedones, papules, pustules, and, in severe cases, nodules and scarring. While genetic predisposition and hormonal influences are well-established contributors, increasing evidence points to modifiable lifestyle factors, particularly diet, as important determinants of acne onset and severity [1–3].

Earlier perspectives considered diet to have a limited role in acne pathogenesis; however, contemporary research challenges this notion. Diets rich in high glycemic index (GI) foods, dairy products, and saturated fats are strongly associated with increased sebum secretion, insulin resistance, and systemic inflammation, which aggravate acne severity [4]. In contrast, consumption of fruits, vegetables, whole grains, and omega-3 fatty acids has been reported to exert protective effects through their antioxidant and anti-inflammatory properties [1,4,5].

Adolescents are particularly vulnerable, as they frequently adopt Westernized dietary habits characterized by fast foods, carbonated beverages, and processed snacks. Such dietary patterns have consistently been associated with higher prevalence and severity of acne compared with traditional diets that emphasize plant-based and minimally processed foods [2,3,5]. Nevertheless, differences across populations suggest that genetic background, environmental factors, and cultural food practices may modify these associations [1,5]. Understanding the interplay between diet and acne severity is crucial during adolescence, the peak period for both acne occurrence and lifestyle experimentation. Identifying these associations could provide opportunities to integrate dietary counseling into acne management strategies, thereby reducing disease burden and enhancing adolescent well-being.

The present study was undertaken to assess the association between dietary patterns and acne severity among adolescents, to identify dietary risk factors, and to provide recommendations for preventive and therapeutic interventions.

Methodology

Study Design and Setting:

This cross-sectional observational study was conducted in the Department of Dermatology, Venereology, and Leprosy at Government Medical College and General Hospital (GMC), Nalgonda, Telangana, India. GMC Nalgonda is a tertiary-care teaching institution serving both urban and rural populations of the Nalgonda district and adjoining areas of Telangana. The dermatology outpatient department caters to an average of 120–150 patients per day, providing diagnostic, therapeutic, and preventive dermatological services. The institutional setup ensures exposure to a broad demographic and socioeconomic mix, enhancing the external validity of the study. The study period extended from August 2024 to April 2025.

Study Population:

The study included adolescents aged 13–19 years attending the dermatology outpatient department during the study period. Participants were recruited consecutively after fulfilling the eligibility criteria.

Inclusion Criteria:

Adolescents aged between 13 and 19 years.
Presence of clinically diagnosed acne vulgaris.
Willingness to provide informed consent (assent from participants and consent from parents/guardians where applicable).

Exclusion Criteria:

Adolescents with other dermatological disorders mimicking acne.
Those currently on systemic retinoids, corticosteroids, or hormonal therapy.
History of chronic systemic illness (e.g., diabetes, polycystic ovarian syndrome).
Unwilling or unable to provide a reliable dietary history.

Sample Size:

A total of 100 adolescents were included in the study, calculated based on feasibility and recruitment during the study period.

Data Collection:

A structured questionnaire was used to collect demographic details (age, gender), dietary history, and lifestyle patterns. Dietary intake was assessed using a semi-quantitative food frequency questionnaire, and participants were categorized into three dietary patterns: *traditional*, *mixed, and Western*. Specific dietary factors, including frequency of dairy consumption, sugary beverages, and fruit and vegetable intake, were also recorded.

Assessment of Acne Severity:

Acne vulgaris was graded using the Global Acne Grading System (GAGS), which categorizes severity as mild, moderate, or severe based on lesion type and distribution.

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Clinical examination was carried out by a qualified dermatologist to ensure consistency in grading.

Statistical Analysis:

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages. Associations between dietary patterns, specific dietary factors, and acne severity were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations:

Ethical clearance was obtained from the Institutional Ethics Committee of GMC Nalgonda before commencement of the study. Written informed consent and assent were obtained from all participants and their guardians as applicable.

Results

Participant Flow

A total of 118 adolescents aged 13–19 years attending the dermatology outpatient department during the study period were screened for eligibility. Of these, 10 were excluded because they did not meet the inclusion criteria (5 had other dermatological disorders mimicking acne, 3 were on systemic corticosteroids or hormonal therapy, and 2 had chronic systemic illnesses such as polycystic ovarian syndrome). Another 8 adolescents declined participation or provided incomplete dietary information. Finally, 100 eligible participants were enrolled and included in the analysis. All enrolled participants completed the study and were included in the final statistical evaluation. There were no dropouts or missing data (Figure 1).

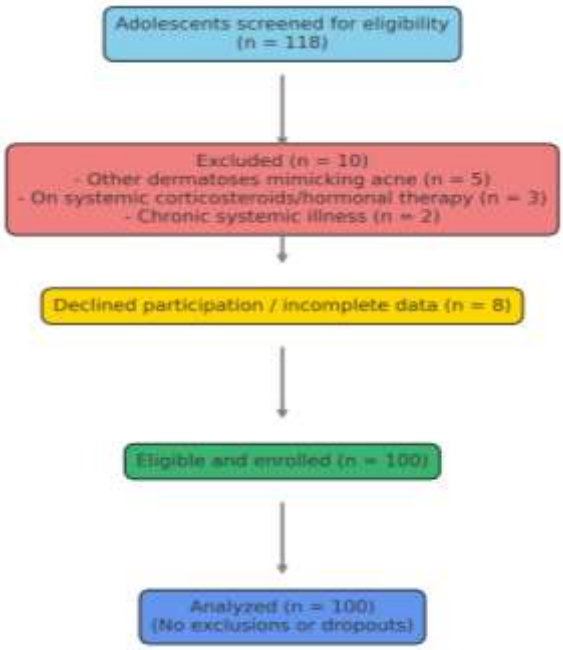

Figure 1: Participant Flow Diagram

A total of 100 adolescents aged 13–19 years were included in the study. The mean age was 16.2 ± 2.1 years, with 42% males and 58% females. The majority of participants were in the 16–17 years age group (38%), followed by 13–15 years (32%) and 18–19 years (30%) (Table 1).

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Table 1. Demographic Characteristics of the Study Population (n = 100)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
13–15	32	32
16–17	38	38
18–19	30	30
Gender		
Male	42	42
Female	58	58

The distribution of acne severity according to the Global Acne Grading System (GAGS) showed that 34% of participants had mild acne, 46% had moderate acne, and 20% presented with severe acne (Table 2).

Table 2. Distribution of Acne Severity (GAGS Classification)

Acne Severity	Frequency (n)	Percentage (%)
Mild	34	34
Moderate	46	46
Severe	20	20

Regarding dietary patterns, 41% of adolescents predominantly consumed a Western diet, 37% followed a mixed diet, and 22% adhered to a traditional diet. Acne severity varied significantly across these dietary patterns ($\chi^2 = 12.42$, $p = 0.002$). Participants consuming a Western diet exhibited the highest proportion of moderate (58.5%) and severe acne (29.3%), while those adhering to a traditional diet demonstrated comparatively lower rates of severe acne (13.6%) (Table 3).

Table 3. Dietary Patterns and Acne Severity

Dietary Pattern	Total (n)	Mild n (%)	Moderate n (%)	Severe n (%)
Traditional (n=22)	22	10 (45.5)	9 (40.9)	3 (13.6)
Mixed (n=37)	37	19 (51.4)	13 (35.1)	5 (13.5)
Western (n=41)	41	5 (12.2)	24 (58.5)	12 (29.3)
Total	100	34	46	20

Chi-square test: p = 0.002

Further analysis of specific dietary factors revealed that frequent dairy consumption (>4 times per week) and intake of sugary beverages (>3 times per week) were significantly associated with higher acne severity ($p = 0.03$ and $p = 0.01$, respectively). Conversely, a higher intake of fruits and vegetables (>5 servings per day) was associated with a lower prevalence of severe acne (11.8% vs. 24.2%, $p = 0.04$) (Table 4).

Table 4. Specific Dietary Factors and Acne Severity

Dietary Factor	Category	Mild n (%)	Moderate n (%)	Severe n (%)	p-value
Dairy intake (>4 times/week)	Yes (n=45)	10 (22.2)	23 (51.1)	12 (26.7)	0.03
	No (n=55)	24 (43.6)	23 (41.8)	8 (14.6)	
Sugary beverages (>3 times/week)	Yes (n=40)	8 (20.0)	20 (50.0)	12 (30.0)	0.01

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	No (n=60)	26 (43.3)	26 (43.3)	8 (13.4)	
Fruits & vegetables (>5 servings/day)	Yes (n=34)	14 (41.2)	16 (47.0)	4 (11.8)	0.04
	No (n=66)	20 (30.3)	30 (45.5)	16 (24.2)	

Discussion

This cross-sectional study demonstrated a significant association between dietary patterns and acne vulgaris severity among adolescents. Statistical analysis revealed that the Western dietary pattern showed the highest proportion of moderate (58.5%) and severe acne (29.3%), while the traditional dietary pattern exhibited only 13.6% severe cases ($p = 0.002$). Furthermore, frequent consumption of dairy products (>4 times/week) and sugary beverages (>3 times/week) significantly increased acne severity ($p = 0.03$ and $p = 0.01$, respectively), whereas higher intake of fruits and vegetables (>5 servings/day) was associated with reduced severity ($p = 0.04$).

These findings indicate that Westernized diets rich in dairy, refined carbohydrates, and sweetened beverages are likely to promote acne exacerbation, possibly through mechanisms involving hyperinsulinemia, increased insulin-like growth factor-1 (IGF-1), and enhanced sebaceous gland activity. Conversely, the protective role of fruits and vegetables may be attributed to their antioxidant and anti-inflammatory effects, which modulate cutaneous inflammation and oxidative stress responses.

Evidence from large-scale cohort research supports this association, where high-glycemic and dairy-based diets significantly elevated acne risk [6]. Nutritional studies have consistently demonstrated that plant-based dietary patterns reduce systemic inflammation and sebum production [7]. Comparable results were documented in adolescent populations from Africa and Asia, where adoption of Western dietary practices correlated with higher acne prevalence than traditional diets [8].

Lifestyle factors also appear to amplify these effects. Studies conducted in Middle Eastern settings reported that irregular eating patterns, frequent fast-food consumption, and psychosocial stress were independently associated with greater acne severity [9]. The current findings align with mechanistic data demonstrating that high glycemic index foods and dairy derivatives stimulate IGF-1 pathways, thereby aggravating follicular keratinization and sebum overproduction [11]. Moreover, contemporary regional data reaffirm that Western dietary and lifestyle habits significantly increase acne risk, emphasizing the importance of dietary modification in preventive dermatology [12].

Generalizability

The findings of this study are likely to be generalizable to adolescents in similar semi-urban and rural settings, particularly within South Indian populations sharing comparable dietary practices and socioeconomic backgrounds. The inclusion of both genders and a wide adolescent age range enhances external validity. However, results may not fully extrapolate to populations with markedly different cultural or nutritional profiles.

Conclusion

This cross-sectional study among adolescents demonstrated a clear association between dietary patterns and acne vulgaris severity. Westernized diets rich in dairy products, refined carbohydrates, and sugary beverages were significantly linked to higher grades of acne, whereas traditional dietary practices emphasizing fruits and vegetables were associated with milder disease. These findings highlight the potential role of diet as a modifiable factor in acne management. While pharmacological therapy remains essential, integrating dietary counseling into adolescent health programs may reduce disease burden and improve quality of life. Larger multicentric and longitudinal studies are recommended to establish causality and guide evidence-based dietary interventions.

Strengths and Limitations

A strength of this study lies in its direct assessment of dietary patterns using a structured questionnaire and clinical grading of acne severity by a dermatologist. However, being cross-sectional, causal inferences cannot be made. Recall bias in dietary reporting and the single-center design limit generalizability.

Recommendations

Adolescents should be encouraged to adopt balanced diets emphasizing fruits, vegetables, whole grains, and foods rich in antioxidants, while limiting high-glycemic foods, sugary beverages, and frequent dairy intake. Dermatologists and primary care physicians are advised to integrate dietary counseling into routine acne management, alongside pharmacological therapy, to optimize outcomes. Schools

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and community health programs should promote awareness regarding the influence of diet on skin health. Policymakers may consider nutrition education initiatives targeting adolescents to reduce lifestyle-related dermatological conditions. Future research should include prospective and interventional studies to validate dietary modifications as a preventive and therapeutic approach for acne vulgaris.

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Abbreviations
GAGS – Global Acne Grading System;
GI – Glycemic Index;
IGF-1 – Insulin-like Growth Factor 1;
SPSS – Statistical Package for the Social Sciences;
OPD – Outpatient Department;
BMI – Body Mass Index.

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The study had no funding.

Conflict of interest
The authors declare no conflict of interest.

Author contributions
RM-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **SVK**-Design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript, revision of the manuscript. **PM**-Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation.

Data availability
Data available on request

Author Biography
Dr. R. Meenakshi, Assistant Professor, Department of Dermatology, Venereology and Leprosy (DVL), Government Medical College & General Hospital, Nalgonda, Telangana, India. She obtained her MBBS degree from Osmania Medical College and pursued an MD in Dermatology, Venereology, and Leprosy from Kakatiya Medical College, Warangal. She joined GMC/GGH Nalgonda as an Assistant Professor in October 2023. Her academic interests include clinical dermatology, dermatosurgery, and medical education.**ORCID ID:**https://orcid.org/0009-0001-2327-2004

Dr. S. Vasantha Kumari, Associate Professor, Department of Dermatology, Venereology and Leprosy (DVL), Government Medical College & General Hospital, Narsampet, Warangal District, Telangana, India. She completed MBBS and MD in DVL from Kakatiya Medical College, Warangal. With over 8 years of teaching and clinical experience, she has actively contributed to both undergraduate and postgraduate dermatology training. Her research areas span autoimmune skin disorders, infectious dermatoses, and evidence-based dermatological practice. **ORCID ID:** https://orcid.org/0009-0008-7114-0621

Dr. Prashanthi Mogili, Assistant Professor, Department of Dermatology, Venereology and Leprosy (DVL), Government Medical College & General Hospital, Janagaon, Telangana, India. She earned her MBBS from Kamineni Institute of Medical Sciences and MD in DVL from Gandhi Medical College, Secunderabad. She joined as an Assistant Professor in May 2023. Her professional focus includes pediatric dermatology, cosmetology, and advancements in diagnostic dermatology. **ORCID ID:** https://orcid.org/0009-0006-7138-5747

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