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ASSOCIATION BETWEEN ULTRA-PROCESSED FOOD CONSUMPTION AND INFLAMMATORY DERMATOLOGICAL DISORDERS IN ADOLESCENTS

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Abstract

Ultra-processed food (UPF) consumption among adolescents has increased dramatically over the past decade and is increasingly implicated in chronic inflammatory conditions, including dermatological disorders. High glycemic load, saturated fats, preservatives, artificial additives, and altered gut microbiota associated with UPFs may contribute to systemic inflammation and skin disease exacerbation. To evaluate the association between ultra-processed food consumption and inflammatory dermatological disorders among adolescents. A hospital-based cross-sectional observational study was conducted among 240 adolescents aged 13–19 years presenting with inflammatory dermatological disorders at a tertiary care teaching hospital. Dietary assessment was performed using a validated food frequency questionnaire based on the NOVA food classification system. Clinical severity of dermatological disorders was assessed using disease-specific scoring systems including Global Acne Grading System (GAGS), SCORAD, and Psoriasis Area Severity Index (PASI). Statistical analysis was performed using SPSS version 27.0.

Among the participants, 68.3% reported frequent consumption of ultra-processed foods. Acne vulgaris was the most common inflammatory dermatological disorder (55.4%), followed by atopic dermatitis (22.9%) and seborrheic dermatitis (9.6%). Higher UPF consumption was significantly

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associated with increased disease severity scores ($p<0.001$). Adolescents consuming carbonated beverages, packaged snacks, processed meats, and fast foods more than four times weekly demonstrated significantly higher inflammatory skin severity indices. Frequent ultra-processed food consumption is significantly associated with increased severity of inflammatory dermatological disorders among adolescents. Dietary counseling and nutritional interventions may represent important adjunctive strategies in adolescent dermatological care.

Keywords: *Ultra-processed food; Adolescents; Acne vulgaris; Inflammatory dermatoses; Diet; Fast food; Dermatology*

Introduction

Inflammatory dermatological disorders represent a major health concern among adolescents worldwide. Conditions such as acne vulgaris, atopic dermatitis, psoriasis, and seborrheic dermatitis significantly affect physical appearance, emotional well-being, social confidence, and quality of life (1). Increasing evidence suggests that dietary patterns may substantially influence inflammatory pathways involved in dermatological disease pathogenesis.

Ultra-processed foods (UPFs), as classified under the NOVA food classification system, are industrial formulations containing additives, preservatives, artificial sweeteners, refined sugars, hydrogenated fats, and highly processed ingredients (2). Common examples include packaged snacks, instant noodles, sugary beverages, fast foods, processed meats, bakery products, and confectioneries. Consumption of UPFs has increased rapidly among adolescents because of urbanization, changing lifestyle patterns, aggressive marketing, and convenience-oriented dietary habits.

Globally, adolescents derive a substantial proportion of daily caloric intake from ultra-processed foods (3). In India, increasing fast-food culture and westernized dietary practices have resulted in rising intake of high glycemic index foods and processed products among school-going adolescents (4). Such dietary transitions have been associated with obesity, metabolic syndrome, insulin resistance, and chronic inflammatory disorders.

The relationship between diet and skin disease is increasingly supported by scientific evidence. High glycemic load foods stimulate insulin and insulin-like growth factor-1 (IGF-1) signaling, leading to increased sebaceous gland activity, follicular hyperkeratinization, and inflammatory cytokine production (5). Similarly, saturated fats, trans fats, artificial additives, and food preservatives may promote oxidative stress and systemic inflammation, thereby aggravating dermatological disorders.

Recent studies have highlighted the role of gut microbiota in inflammatory skin diseases through the gut-skin axis (6). Excessive consumption of UPFs may alter intestinal microbiome diversity,

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increase intestinal permeability, and promote chronic inflammatory responses that contribute to dermatological disease exacerbation.

Acne vulgaris has shown particularly strong dietary associations. Milk products, sugary beverages, chocolate-rich foods, and processed carbohydrates have been implicated in worsening acne severity (7). Likewise, psoriasis and atopic dermatitis may be influenced by pro-inflammatory dietary patterns rich in processed food components.

Despite growing global evidence, limited Indian studies have comprehensively evaluated the relationship between ultra-processed food consumption and inflammatory dermatological disorders among adolescents. Most available literature focuses predominantly on acne vulgaris without broader assessment of inflammatory skin disorders.

The present study was therefore conducted to evaluate the association between ultra-processed food consumption and inflammatory dermatological disorders among adolescents attending a tertiary care teaching hospital.

Materials and Methods

This hospital-based cross-sectional observational study was conducted in the Departments of Pediatrics and Dermatology at Venkateshwara Institute of Medical Sciences over a duration of 12 months from January 2025 to December 2025.

A total of 240 adolescents aged 13–19 years diagnosed with inflammatory dermatological disorders were enrolled using consecutive sampling. Participants included adolescents diagnosed with acne vulgaris, atopic dermatitis, psoriasis, seborrheic dermatitis, and chronic urticaria.

Dietary assessment was performed using a validated food frequency questionnaire structured according to the NOVA classification system for ultra-processed foods. Frequency of consumption of carbonated beverages, packaged snacks, processed meats, instant foods, sugary bakery products, chocolates, and fast foods was documented.

Clinical severity assessment was conducted using disease-specific scoring systems including Global Acne Grading System (GAGS), SCORAD index, and Psoriasis Area Severity Index (PASI). Anthropometric measurements including body mass index were also recorded.

Adolescents with chronic systemic illnesses, endocrine disorders, autoimmune diseases, immunodeficiency, or those receiving systemic corticosteroids or immunomodulators were excluded from the study.

Ethical approval was obtained from the Institutional Ethics Committee of Venkateshwara Institute of Medical Sciences. Written informed consent and assent were obtained prior to enrollment.

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Data analysis was performed using SPSS version 27.0. Chi-square test, Pearson correlation analysis, independent t-test, and multivariate regression analysis were applied. A p-value <0.05 was considered statistically significant.

Results

A total of 240 adolescents participated in the study, including 132 females (55%) and 108 males (45%). The mean age of participants was 16.4 ± 1.7 years.

Table 1. Distribution of Inflammatory Dermatological Disorders

Disorder	Frequency (n)	Percentage (%)
Acne vulgaris	133	55.4
Atopic dermatitis	55	22.9
Seborrheic dermatitis	23	9.6
Psoriasis	18	7.5
Chronic urticaria	11	4.6

Table 2. Association Between Ultra-Processed Food Consumption and Disease Severity

Frequency of UPF Consumption	Mild Disease	Moderate Disease	Severe Disease
Rare (<1/week)	42	16	4
Moderate (2–3/week)	28	40	18

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Frequent (>4/week)	12	36	44

A statistically significant association was observed between frequent UPF consumption and increased dermatological disease severity ($p<0.001$).

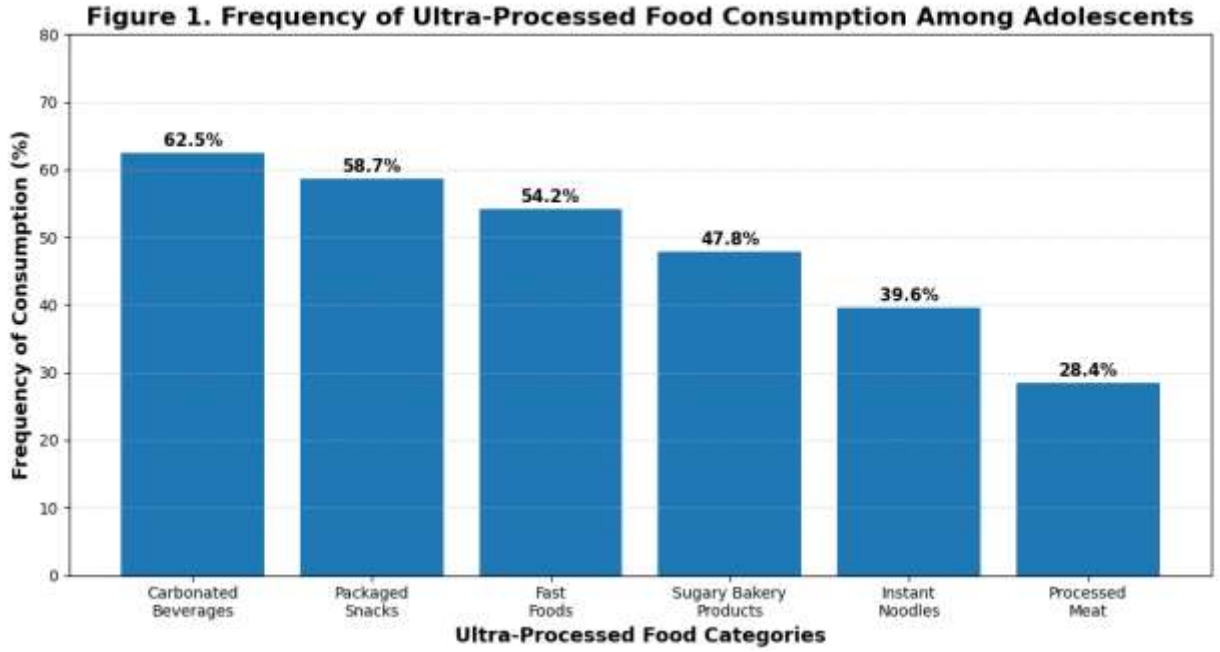

Figure 1. Frequency of Ultra-Processed Food Consumption Among Adolescents

Packaged snacks and carbonated beverages were the most frequently consumed ultra-processed food items among adolescents, followed by fast foods and sugary bakery products.

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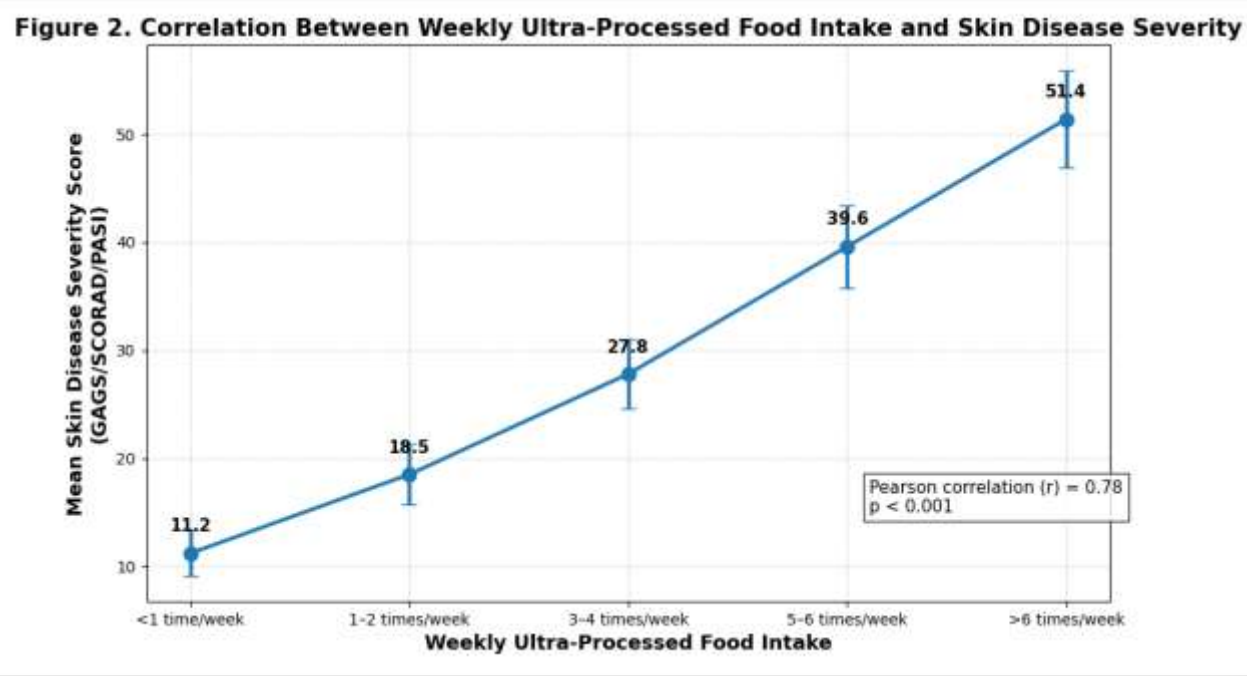

Figure 2. Correlation Between Weekly Ultra-Processed Food Intake and Skin Disease Severity

Discussion

The present study demonstrated a significant association between ultra-processed food consumption and inflammatory dermatological disorder severity among adolescents. These findings support emerging evidence linking westernized dietary patterns with chronic inflammatory skin diseases.

Acne vulgaris was the most common dermatological disorder observed in the study population, consistent with global epidemiological literature (5). Adolescents with frequent consumption of sugary beverages, processed snacks, and fast foods demonstrated significantly higher acne severity scores. High glycemic index foods increase insulin and IGF-1 signaling, thereby stimulating sebaceous gland activity and follicular keratinization.

The findings are consistent with previous studies by Cordain et al. and Smith et al., which demonstrated worsening acne severity with western dietary patterns rich in processed carbohydrates and refined sugars (8,9). Increased inflammatory cytokine activity and oxidative stress induced by processed food components may further aggravate dermatological inflammation.

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The role of saturated fats and trans fats present in ultra-processed foods also deserves consideration. These dietary components contribute to systemic inflammation and oxidative stress, promoting chronic inflammatory responses in the skin (10). Additionally, preservatives and artificial additives may alter immune regulation and skin barrier function.

The gut-skin axis has emerged as a critical mechanism linking diet and dermatological health. Excessive ultra-processed food intake alters gut microbiota diversity, increases intestinal permeability, and promotes systemic inflammatory responses (6). Dysbiosis-associated inflammatory mediator release may contribute to exacerbation of acne vulgaris, psoriasis, and atopic dermatitis.

Atopic dermatitis patients in the present study also demonstrated higher disease severity with frequent UPF intake. Similar findings have been reported in studies evaluating western dietary patterns and eczema prevalence among adolescents (11). Processed foods rich in additives and preservatives may increase allergic sensitization and inflammatory responses.

The present study also carries significant public health implications. Adolescents in urban and semi-urban India increasingly consume fast foods, sugary beverages, and packaged snacks because of convenience, peer influence, and aggressive marketing. Nutritional counseling and dietary awareness programs may therefore represent important preventive strategies in adolescent dermatological healthcare.

One of the strengths of the present study is the use of validated dietary assessment methods and disease-specific severity scoring systems. Inclusion of multiple inflammatory dermatological disorders rather than isolated acne assessment provided broader insight into dietary-inflammatory interactions.

However, certain limitations should be acknowledged. Dietary assessment relied partially on self-reported food frequency data, which may introduce recall bias. The cross-sectional design limits establishment of causal relationships. Additionally, the study was conducted at a single tertiary care center, potentially limiting broader generalizability.

Despite these limitations, the present study strongly highlights the role of ultra-processed food consumption in adolescent inflammatory dermatological disorders and emphasizes the importance of dietary modification in dermatological management.

Conclusion

Frequent ultra-processed food consumption is significantly associated with increased severity of inflammatory dermatological disorders among adolescents. Carbonated beverages, packaged snacks, fast foods, and processed carbohydrates appear to contribute substantially to inflammatory

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skin disease exacerbation. Dietary counseling and lifestyle modification should be integrated into adolescent dermatological care to improve long-term clinical outcomes.

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