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The Effect of Using Acne Creams Containing Steroids on the Appearance of Inflammatory Acne

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Abstract

Background: Acne vulgaris is common in adolescents and young adults and can decrease quality of life. Self-medication with creams containing topical corticosteroids is still prevalent and has the potential to trigger inflammatory acne.
Objective: This study assessed the relationship between exposure to steroid-containing creams and the appearance of inflammatory acne.
Methods: A cross-sectional observational study was conducted among adolescents and young adults aged 15–41 years with acne complaints, recruited via an online questionnaire using consecutive sampling (n = 110). Topical steroid exposure (yes/no) and inflammatory acne occurrence (yes/no, assessed using reference lesion images) over the past 3 months were the primary independent and outcome variables, respectively. The association was evaluated using the Pearson chi-square test, with prevalence ratio (PR) and 95% confidence interval (CI).
Results: Of 110 subjects (mean age, 22.95 years; 54.5% female), 28.2% reported topical steroid exposure and 69.1% had inflammatory acne. The proportion of inflammatory acne was significantly higher in the exposed group (90.3%) than in the unexposed group (55.7%), with a PR of 1.62 (95% CI, 1.28–2.06; p = 0.001). The dominant symptoms in the inflammatory acne subgroup were a burning/heat sensation (56.6%) and pain (50.0%).
Conclusion: Topical steroid exposure was significantly associated with inflammatory acne in this population. These findings underscore the need to avoid unsupervised use of steroid-containing anti-acne creams. The cross-sectional design limits causal inference; therefore, prospective studies with clinical confirmation and control of confounding factors are warranted.

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INTRODUCTION

Acne vulgaris is a chronic inflammatory disease in the pilosebaceous unit that most often affects adolescents and young adults, with clinical impacts that can continue into adulthood. Epidemiologically, acne is among the most prevalent dermatoses in the world. Epidemiological data show a pattern of incidence in adolescence, with a significant burden persisting into young adulthood. In addition, other findings report that >85% of adolescents have experienced acne, and it is estimated to affect about 9.4% of the global population, confirming that acne is a very widespread and persistent skin health problem.

Data from the Global Burden of Disease also place acne as one of the most common skin conditions in the 12–25-year age group. Vasam (2023) highlight that acne vulgaris involves a multifactorial pathophysiology encompassing sebaceous gland hypersecretion, follicular hyperkeratinization, proliferation of Cutibacterium acnes, and dysregulated inflammatory immune responses, which collectively make it challenging to treat effectively without professional guidance. Recent research further underscores that despite a wide array of evolving treatment approaches—including novel nanotechnology-based delivery systems and targeted anti-inflammatory agents—the management of acne remains an area of active investigation, particularly regarding the prevention of inappropriate self-medication (Li et al., 2024; Guguluș et al., 2025; Reynolds et al., 2024).

The problem of acne is not only determined by the number of cases, but also by the burden of disability and its impact on quality of life. The latest estimates report millions of disability-adjusted life years (DALYs) related to acne in 2021, reflecting the cumulative impact of acne on psychosocial functioning, productivity, and well-being, particularly in low- and middle-income countries (Zhu et al., 2025). In Indonesia, acne is also a significant skin health problem, with the Ministry of Health reporting that the prevalence of acne reaches around 87.5%. Research in Malang showed a high variation in the prevalence of acne vulgaris, reaching 55.7% of respondents (Wulandari et al., 2020).

Amid high prevalence, the practice of self-medication and the use of skincare products without clinical supervision are increasingly prominent problems. Access to over-the-counter topical corticosteroids is still common and can worsen skin diseases due to improper indications and duration of use. In practice, topical corticosteroids can appear in mixed products or creams used for a variety of complaints, including acne, because their effect can quickly reduce redness or discomfort. In Indonesia, regulatory authorities have also highlighted findings of steroid ingredients in illegal cosmetic products and emphasized that cosmetics are prohibited from containing medicinal ingredients that require medical supervision, thus illustrating the risk of inadvertent exposure to steroids. This condition has the potential to encourage the use of steroid-containing creams in the young population, which is the group with the highest acne burden, while increasing the risk of cutaneous side effects and more difficult-to-treat disease patterns (Wulandari et al., 2020; Cruz et al., 2023).

Clinically, exposure to corticosteroids, including in topical form, can aggravate acne and inflammatory lesions. Previous studies have shown that corticosteroids can cause acneiform eruptions, including at the site of application, with a monomorphic papulopustular appearance, and in some cases can obscure the natural course of the disease so that patients receive appropriate acne therapy late. On the other hand, the concept of dependency and the phenomenon of rebound after discontinuation of topical corticosteroids (topical steroid addiction/withdrawal) has also been discussed as a spectrum of problems resulting from improper steroid use, involving changes in glucocorticoid receptor responses, skin barrier disruption, and inflammatory cascades that can lead to clinical manifestations in the form of inflammatory acne.

Thus, the use of anti-acne creams containing steroids has the potential to worsen inflammatory acne in patients. Durairaj (2023) further describe that inflammatory acne—particularly the cystic form—arises from a complex interplay between sebum overproduction, bacterial colonization, and dysregulated innate and adaptive immunity. Corticosteroid exposure has the potential to suppress local immune responses and thereby perpetuate the inflammatory cycle, paradoxically worsening rather than resolving acne (Durairaj et al., 2023). This mechanistic understanding reinforces the public health significance of the present study, as it highlights why unsupervised use of steroid-containing anti-acne products may aggravate the inflammatory acne burden in community settings (Tan & Bhate, 2015; Ghouse et al., 2024).

Based on this background, analytical evidence is needed to assess the relationship between exposure to steroid-containing creams and the incidence of inflammatory acne in adolescent and young adult populations. This study aims to evaluate the relationship between the use of anti-acne creams containing steroids and the appearance of inflammatory acne, as well as to provide a basis for patient education, improvement of self-medication practices, and strengthening efforts to prevent improper exposure to steroids in common skin conditions in the community.

METHOD

Research design

This study was an analytical observational study with a cross-sectional design to assess the relationship between exposure to anti-acne creams containing steroids and the incidence of inflammatory acne in the preceding 3 months. The study was conducted using an online, form-based structured questionnaire that included demographic characteristics, acne history, treatment history, topical steroid exposure status, and inflammatory acne outcomes and related symptoms.

Population and sample

The target population consisted of adolescents to young adults who had acne complaints. The study sample comprised respondents who completed the questionnaire in full and met the eligibility criteria, with a minimum sample size based on a two-group comparison formula (two-tailed) of 100 participants. The sampling technique used was response-based consecutive sampling, where all respondents who met the criteria during the recruitment period were included as samples. Inclusion criteria included ages 15 to 41 years, having or having had acne, willingness to participate in the study, and complete questionnaire responses. Exclusion criteria included incomplete responses, duplicate entries, or uninterpretable key data (particularly on topical steroid exposure variables or inflammatory acne status). In the primary relationship analysis, the "unsure" category for steroid exposure was treated as "no" exposure data to minimize misclassification and overfitting of exposure classification.

Variables and data

The primary independent variable was exposure to topical steroid-containing anti-acne creams in the past 3 months, which was measured using a targeted question with three response options (yes, no, not sure). Respondents were categorized as "exposed" when they answered "yes" and "not exposed" when they answered "no." The main dependent variable was the incidence of inflammatory acne in the past 3 months, assessed using a lesion reference image-based question (Figure 1): "In the last 3 months, have acne lesions appeared with a similar appearance to the image?" with responses of "yes" or "no." A "yes" response was classified as inflammatory acne.

Additional data collected included basic participant characteristics (age, BMI, sex, highest education level, occupation) as well as acne characteristics (age of onset, duration of symptoms, predominant location, family history of acne, and treatment history in the past 4 weeks, including topical therapy, oral therapy, and non-pharmacological therapy). In participants with inflammatory acne, data on related symptoms were collected using an ordinal scale from 0 to 3 for each symptom, namely pain, itching, tenderness/irritation, heat/burning sensation, easy bleeding, and discharge/pus. The scoring was defined as 0 = none, 1 = mild, 2 = moderate, and 3 = severe, based on an adaptation of the FACE-Q questionnaire.

Figure 1. Description of inflammatory acne

Data collection procedure

Data collection was conducted through an online form consisting of informed consent sections, demographic characteristics, acne history, treatment history, topical steroid exposure, and outcome assessment. Assessment of inflammatory acne used image-based questions to help standardize respondents' perceptions of the lesions in question. Respondents who answered "yes" to the inflammatory acne question then continued to complete the symptom module using a scale of 0 to 3. Before analysis, data completeness and consistency were checked; duplicate or incomplete responses for core variables were excluded according to the exclusion criteria.

Data analysis

Descriptive analysis was used to describe the characteristics of the subjects, with numerical data presented as mean ± standard deviation as well as range (min–max), and categorical data presented as frequency (n) and percentage (%). Bivariate analysis was performed to assess the association between topical steroid exposure (yes vs no) and the incidence of inflammatory acne (yes vs no) using the Pearson chi-square test, with a significance level of $p < 0.05$. The magnitude of the association was reported as a prevalence ratio (PR) along with a 95% confidence interval (CI 95%). Data processing was conducted using SPSS software version 25.0.

RESULTS AND DISCUSSION

Results

Basic characteristics of the research subject

A total of 110 participants were included as study subjects, with an average age of 22.95 ± 5.70 years (range 15–41 years) and an average BMI of 22.29 ± 3.02 kg/m^2 (range 15.92–31.10 kg/m^2). The gender composition was relatively balanced, with 60 females (54.5%) and 50 males (45.5%). The highest level of education was dominated by S1/S2/S3 graduates (37.3%) and high school graduates (32.7%), followed by diploma holders (20.9%), while junior high school (8.2%) and elementary school (0.9%) graduates comprised smaller proportions. In terms of employment, the largest group consisted of students (30.9%) and employees (29.1%), followed by unemployed individuals (19.1%), self-employed individuals (12.7%), and laborers (8.2%) (Table 1).

Table 1. Basic characteristics of the research subject

Variable	**N = 110**
Age (years); Average ± standard deviation (Min–Max)	22.95 ± 5.70 (15–41)
BMI (kg/m2); Average ± standard deviation (Min–Max)	22.29 ± 3.02 (15.92–31.10)
Gender; n (%)	
Male	50 (45,5)
Women	60 (54,5)
Last education; n (%)	
SD	1 (0,9)
Junior High School	9 (8,2)
High School	36 (32,7)
Diploma	23 (20,9)
S1/S2/S3	41 (37,3)
Occupation; n (%)	
Student/Student	34 (30,9)
Not working	21 (19,1)
Employees	32 (29,1)
Self-employed	14 (12,7)
Labor	9 (8,2)

Characteristics of acne research subjects

The characteristics of acne show a mean age of onset of 14.69 ± 2.31 years (range: 10–21 years). Most subjects reported a duration of acne complaints of >5 years (69.1%), while 23.6% reported a duration of 1–5 years; shorter durations were relatively rare (6–12 months: 5.5%; <6 months: 1.8%). Acne was predominantly located on the face (53.6%), followed by multiple sites (24.5%), the back (14.5%), and the chest (7.3%). A family history of acne was reported in 48.2% of subjects, with 33.6% reporting no family history and 18.2% reporting an unknown family history. In the past 4 weeks, most subjects used topical therapy (70.9%), while oral therapy was used by 47.3%, and non-pharmacological therapy was reported in 27.3%. Regarding exposure to steroid-containing creams in the past 3 months, 28.2% reported yes, 63.6% reported no, and 8.2% were unsure. The incidence of inflammatory acne in the past 3 months was observed in 69.1% of subjects (Table 2).

Table 2. Characteristics of acne research subjects

Variable	**N=110**
First age of acne (years); Average ± standard deviation (Min–Max)	14.69 ± 2.31 (10–21)
Long acne complaints; n (%)	
< 6 months	2 (1,8)
6–12 months	6 (5,5)
1–5 years	26 (23,6)
> 5 years	76 (69,1)
The location of acne is dominant; n (%)	
Face	59 (53,6)
Dada	8 (7,3)
Back	16 (14,5)
Combinations	27 (24,5)
family history of acne; n (%)	
Yes	53 (48,2)
No	37 (33,6)
Don't know	20 (18,2)
Therapy of the last 4 weeks; n (%)	
Topical therapy	
Yes	78 (70,9)
No	32 (29,1

Oral therapy	
Yes	52 (47,3)
No	58 (52,7)
Non-pharmacological therapies	
Yes	30 (27,3)
No	80 (72,7)
Exposure to steroid-containing creams (last 3 months); n (%)	
Yes	31 (28,2)
No	70 (63,6)
Not sure	9 (8,2)
Inflammatory acne (last 3 months); n (%)	
Yes	76 (69,1)
No	34 (30,9)

Furthermore, Table 3 illustrates the degree of acne-related symptoms in subjects with inflammatory acne (n = 76). In general, reported symptoms tended to be moderate to severe. Pain complaints were most common in severe (50.0%) and moderate (38.2%) degrees, while mild cases accounted for only 11.8%. A similar pattern was observed in itching (severe 46.1%; moderate 42.1%), soreness/irritation (severe 48.7%; moderate 39.5%), and heat/burning, which was the most common symptom in terms of severity (56.6%). In addition, complaints indicating active inflammatory involvement also stood out, such as bleeding easily (severe 44.7%; moderate 42.1%) and discharge/pus (severe 43.4%; moderate 38.2%), with a very low proportion of asymptomatic cases across all items in each category.

Table 3. Characteristics of acne-related symptoms

Symptoms	**None;** n (%)	**Lightweight;** n (%)	**Medium;** n (%)	**Weight;** n (%)
Pain	0 (0,0)	9 (11,8)	29 (38,2)	38 (50,0)
Itching	1 (1,3)	8 (10,5)	32 (42,1)	35 (46,1)
Stinging/irritation	0 (0,0)	9 (11,8)	30 (39,5)	37 (48,7)
Feeling hot/burning	2 (2,6)	6 (7,9)	25 (32,9)	43 (56,6)
Bleeding easily	1 (1,3)	9 (11,8)	32 (42,1)	34 (44,7)
Discharge/pus discharge	1 (1,3)	13 (17,1)	29 (38,2)	33 (43,4)

The relationship between topical steroid use and inflammatory acne

The results of the bivariate analyses showed a significant association between topical steroid use/exposure and inflammatory acne (Table 4). In the group that reported topical steroid use/exposure (n = 31), the proportion of inflammatory acne cases was very high, with 28 subjects (90.3%), whereas only 3 subjects (9.7%) had non-inflammatory acne. In contrast, in the group without topical steroid use/exposure (n = 70), inflammatory acne was found in 39 subjects (55.7%), while non-inflammatory acne was observed in 31 subjects (44.3%). Statistically, topical steroid use/exposure was associated with an increased risk of inflammatory acne incidence, with a PR of 1.62 (95% CI: 1.28–2.06) and a p-value of 0.001, indicating a significant association.

Table 4. The relationship between topical steroid use and inflammatory acne

Variable	**Inflammatory acne; n (%)**		**PR (IK95%)**	**Value p**
	Yes	No		
Topical Steroids				
Yes	28 (90,3)	3 (9,7)	1,62 (1,28–2,06)	0,001*
No	39 (55,7)	31 (44,3)		

*Statistically significant (p<0.05) based on Chi Square test

Discussion

This study showed that inflammatory acne within the last 3 months occurred in 69.1% of respondents, with exposure to anti-acne creams containing steroids reported in 28.2% of respondents, and symptoms among subjects with inflammatory acne were generally moderate to severe. There was a significant association between topical steroid exposure and the occurrence of inflammatory acne; therefore, the use of steroid-containing creams without appropriate indications and clinical supervision should be avoided. The study found that the group reporting exposure to topical steroids had a much higher proportion of inflammatory acne than the group without exposure.

The results of this study are consistent with previous research on steroid-induced acne and acneiform manifestations associated with topical corticosteroid abuse. Jha (2016) reported steroid-induced acne in 176 of 410 users of facial topical corticosteroids (42.9%). In addition, research by Pal (2018) also reported acne or exacerbation of acne in 68 out of 271 cases of facial topical corticosteroid use (25.09%) in a patient population with facial dermatoses. In line with these two studies, Meena (2017) also reported acne as one of the most frequent side effects among users presenting with topical corticosteroid-related adverse effects, accounting for 112 out of 370 cases (30.27%). Similarly, Sharma (2017) reported steroid acne in 46 out of 200 cases of facial topical corticosteroid abuse (23%).

From the perspective of the biological mechanisms underlying the findings of this study and previous research, topical corticosteroids may suppress the local immune response, alter skin barrier function, and facilitate the formation of microcomedones and follicular inflammation, which manifest as monomorphic papulopustular lesions or exacerbation of preexisting acne. In addition, a literature review on topical steroid-damaged face explained that prolonged use can give rise to characteristic clinical patterns, including acneiform papulopustules, burning sensations, and flare-ups upon discontinuation; consequently, patients often enter cycles of reuse to relieve temporary symptoms (Pal et al., 2018). Furthermore, dermoscopic research on topical steroid-dependent face (TSDF) also reported vascular and inflammatory changes consistent with chronic irritant-inflammatory processes in facial skin caused by steroid exposure (Sethi et al., 2021). Current acne management guidelines do not include topical corticosteroids as part of core acne therapy and instead emphasize topical regimens targeting comedogenesis and inflammation; therefore, the use of topical steroids as acne creams is inconsistent with evidence-based acne treatment principles.

The irrationality of steroid use in acne management is further underscored by the availability of evidence-based topical alternatives that specifically target the androgen receptor pathway, such as clascoterone, which has been shown to reduce sebum production and inflammatory lesion counts without the adverse effects associated with corticosteroid application (Kalabalik-Hoganson et al., 2021). It is also noteworthy that drug-induced acne, including acne arising from corticosteroid exposure, has been documented in diverse clinical settings beyond dermatology. For instance, reported that corticosteroids used in the management of inflammatory bowel disease can trigger acneiform eruptions, highlighting that the acnegenic potential of steroids is a cross-specialty concern requiring awareness among both clinicians and patients (Temido et al., 2025; Reynolds et al., 2024; Zaenglein et al., 2016; Eichenfield et al., 2021).

Although this study found a significant association between topical steroid use and the incidence of inflammatory acne, the influence of confounding variables still needs to be considered. The study included young subjects with a relatively balanced sex distribution, suggesting that certain demographic factors may have had less influence as isolated confounders; however, demographic characteristics may still affect the likelihood of steroid exposure through self-care behaviors and cosmetic motivations. Research by Pal (2018) reported a predominantly female population, with a female-to-male ratio of 2.66:1 among facial topical corticosteroid users, and the 20–29-year age group was the most frequent group using topical steroids (37.10%).

Similar findings were also reported by Jha (2018) who found female predominance among users of facial topical corticosteroids, with 306 out of 410 users (74.6%) being women. The clinical profile of TSDF in other studies also demonstrated a concentration of cases among individuals of productive age, with complaints of burning sensations and prominent inflammatory lesions; for example, acneiform eruptions were reported in 22 out of 100 cases (22%) in TSDF clinical reports

(Shrestha et al., 2020). Therefore, patterns associated with younger age and cosmetic behavior tendencies in certain populations may increase the probability of steroid exposure Ghouse (2024); Jain (2020); Saraswat (2011), and these demographic factors may strengthen the association between topical steroid exposure and inflammatory acne observed in this study.

This study also showed that most study subjects had long-standing acne, an earlier age of onset, predominantly facial involvement, and a relatively frequent family history of acne, suggesting that chronic disease burden and biological predisposition may contribute to the occurrence of inflammation. A literature review of adult acne cases states that acne may persist or recur because of a combination of genetic predisposition, persistent inflammation, and pilosebaceous unit responses to environmental triggers; consequently, patients with long-standing complaints often try various topical products outside medical supervision (Reynolds et al., 2024). This finding is also consistent with previous reports indicating that topical corticosteroids are frequently used specifically for acne treatment, as reported by Pal (2018) in which 98 of 271 users (36.16%) used topical corticosteroids for acne.

Based on these findings, the chronicity of acne and familial predisposition may encourage more aggressive self-medication practices, which are likely to influence the association between steroid use and the incidence of inflammatory acne in this study. In the context of severe or refractory acne, it is important to note that steroid injections, specifically intralesional corticosteroids, do have a legitimate indication-specific role in the management of nodulocystic lesions when administered under clinical supervision. Lee (2025) emphasized that such use is confined to targeted, short-term interventions and must be clearly distinguished from the indiscriminate use of topical steroid-containing creams without professional guidance. Moore (2025) similarly described acne conglobata, a severe inflammatory variant of acne, as requiring specialized, guideline-concordant treatment strategies, and noted that prior inappropriate treatment, including unsupervised topical steroid application, may complicate the disease course and delay effective clinical management.

The study also reported the use of topical and oral therapies within recent weeks among most study subjects, as well as moderate to severe inflammatory symptoms in subjects with inflammatory acne, suggesting that changes in therapeutic regimens and skin irritation may modify the clinical expression of acne lesions. These findings are consistent with research by Nagesh (2016), who reported that the most frequent indication for topical steroid use was acne (30.2%), and that some users reported the appearance or worsening of acne as a presenting complaint; therefore, patterns of experimental therapy use without a physician's prescription may be directly related to lesion exacerbation. In addition, TSDF studies also reported symptoms such as burning and itching as frequent complaints; for example, burning sensations were reported in 57% of study subjects, and itching was reported in 21% of study subjects (Shrestha et al., 2020). These symptoms may overlap with perceptions of worsening inflammation in preexisting acne and may encourage repeated steroid use (Shrestha et al., 2020).

This study has the strength of providing a relatively detailed clinical characterization of the subjects and a clear measurement of the association between topical steroid exposure and the incidence of inflammatory acne within a specific time frame. However, this study remains limited because its cross-sectional design could not establish a causal relationship, measurements of steroid exposure relied on subject self-reporting, and important variables such as steroid potency, cumulative duration of use, combination product composition, and baseline acne severity were not objectively analyzed. Further research using prospective designs, product verification, and control of confounding variables is needed to improve the accuracy and validity of the observed associations.

CONCLUSION

This study showed that inflammatory acne within the last 3 months occurred in 69.1% of respondents, with exposure to anti-acne creams containing steroids reported in 28.2% of respondents. Symptoms among subjects with inflammatory acne were generally moderate to severe. There was a significant association between exposure to topical steroids and the occurrence of inflammatory acne; therefore, the use of steroid-containing creams without diappropriate indications and clinical supervision should be avoided. Further follow-up studies

with clinical confirmation and control of confounding variables are needed to strengthen causal inference.

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AUTHOR CONTRIBUTION STATEMENT

Puguh Riyanto and Devina Adiyani Pranowo contributed to the conceptualization, study design, and data collection. Cindy and Leoni Agnes were responsible for data analysis, interpretation, and manuscript drafting. All authors reviewed, revised, and approved the final version of the manuscript, ensuring the integrity and accuracy of the reported findings.

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