Annals of Medicine and Medical Sciences (AMMS)
Volume 04, 2025, *Page No.: 816 to 822*
Available at: *http://ammspub.com*

**Original Article**

OPEN ACCESS

# Assessment of Adverse Effects and Quality of Life in Sudanese Acne Patients Treated with Oral Isotretinoin: A Descriptive Cross-Sectional Study

**Ibtihal A. Mohamed [1], Fatima S. Naim [1], Mawahib A. Mustafa [1], Elkhanssa Abdelhameed Ahmed Elhag [1], Mohammed H. Alnazeer [2], Kannan O. Ahmed [3,4], Bashir A. Yousef [2,5]**

[1]Department of Pharmacy Practice, Faculty of Pharmacy, University of Khartoum, Khartoum, Sudan.
[2]Department of Pharmacology, Faculty of Pharmacy, University of Khartoum, Khartoum, Sudan.
[3]Department of Pharmacy Practice, College of Pharmacy, National University of Science and Technology, Muscat, Oman.
[4]Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Gezira, Wad Medani, Sudan.
[5]Department of Clinical Pharmacy and Pharmacology, Ibn Sina College for Medical Studies, Jeddah, Saudi Arabia.

*Corresponding Author: Bashir A. Yousef; *bashiralsiddiq@gmail.com*

## Abstract

***Objectives:*** Oral isotretinoin is an effective treatment for moderate to severe acne but is often associated with systemic side effects and psychological impact. This study assessed adverse effects and quality of life in Sudanese acne patients undergoing isotretinoin therapy. ***Design:*** A cross-sectional descriptive study. ***Methods:*** The research was carried out from January to March 2023 in private dermatology clinics in Khartoum, Sudan. A purposive sample of 62 acne patients aged 18 years and older who were on oral isotretinoin was recruited. Data were gathered via structured face-to-face interviews using a questionnaire containing demographic, side effects reported, and validated psychometric instruments: the Cardiff Acne Disability Index (CADI) and Skindex-16. Data were analyzed using SPSS. ***Results:*** Most participants were women (77.4%) and between 20–30 years old (72.6%). Most were treated with 20 mg/day isotretinoin. Side effects were xerostomia (95.2%), xerosis (93.5%), thirst (82.3%), cheilitis (53.2%), and myalgia (46.8%). Skindex-16 scores indicated moderate impairment: symptoms (44%), emotions (49%), and function (35%). The average CADI score was 7 ± 3, reflecting intermediate psychological burden. Functional scores were significantly related to severe acne, noncompliance with treatment, and dosage. ***Conclusion:*** Oral isotretinoin is linked with a variety of side effects and modest psychosocial effect. Periodic monitoring of patient health during treatment is advised.

**Keywords:** ***Acne Vulgaris, Adverse effects, Cardiff Acne Disability Index, Isotretinoin, Psychological Impact, Quality of Life, Skindex-16, Sudan.***

## Introduction

Acne vulgaris is a ubiquitous dermatologic disorder of the pilosebaceous unit (PSU) with a multifactorial cause. It is noninflammatory (open and closed comedones) or inflammatory (papules, pustules, nodules) [1,2]. Acne affects over 80% of individuals predominantly adolescents and young adults at some point in their lifetime [2]. Based on severity, acne is classified as Grade 1 (mild), Grade 2 (moderate), and Grade 3 (severe) [3]. The management of acne involves the use of topical retinoids, antimicrobials, oral contraceptives, hormonal agents, systemic antibiotics, and oral isotretinoin [4,5]. Oral isotretinoin, a synthetic vitamin A derivative, is also recognized as the most effective medication for severe or recalcitrant acne. It works by possessing anti-inflammatory actions, decreasing sebum secretion, decreasing Propionibacterium acnes populations, and inhibiting comedogenesis [5-7]. The typical initial dose is 0.5 mg/kg/day and may be increased to 1.0 mg/kg/day, and the therapy may be extended for a duration of 6 months. For intractable nodulocystic acne, doses of 1–2 mg/kg/day might be required [7,8].

Oral isotretinoin has a wide range of adverse drug reactions (ADRs). Mucocutaneous manifestations such as cheilitis, xerosis, xerostomia, dry nose, epistaxis, pruritus, skin infections, and alopecia are common [9]. Systemic ADRs may manifest as cardiovascular, musculoskeletal pain, gastrointestinal symptoms (nausea, vomiting, and changes in appetite), central nervous system reactions (fatigue and headache), endocrine and metabolic disturbances, and psychiatric symptoms [7,10]. An FDA


**Received:** July 16, 2025; **Revised:** August 01, 2025; **Accepted:** August 04, 2025

pharmacovigilance report (1997–2017) documented 17,829 psychiatric adverse isotretinoin events, with depressive and anxiety disorders being most prominent [11]. Furthermore, adverse effects of oral isotretinoin, particularly mucocutaneous and systemic reactions can significantly impair patients' quality of life, often affecting emotional well-being, social functioning, and treatment adherence [12].

## Methods

***Study design and setting:*** This was a descriptive cross-sectional observational research conducted in private dermatological clinics in the Khartoum locality of Sudan between January and March 2023 over a duration of three months. The patients who were actively receiving oral isotretinoin for acne treatment were targeted in this research.

***Study population:*** A purposive sampling strategy was utilized. All patients who met the inclusion criteria (i.e., receiving present treatment with oral isotretinoin for acne, 18 years of age or older, and agreeing to participate) were invited to take part. Sixty-two participants were enrolled and completed the study successfully

***Data collection tool:*** Data were collected through structured face-to-face interviews using a pretested data collection sheet. The instrument collected data on: Sociodemographic data (age, gender). Clinical data: duration of treatment, dose of isotretinoin, and frequency of dosing. Side effects of oral isotretinoin. Psychological impact assessed using two validated tools: the Cardiff Acne Disability Index (CADI) and Skindex-16.

***Evaluation Instruments Cardiff Acne Disability Index (CADI):*** Each question was marked on a 0 to 3 scale ((a)=3, (b)=2, (c)=1, (d)=0). Overall score ranged from 0 to 15, and the higher the score, the more the psychosocial impact. Scores were then translated into percentage scores for interpretation [13]. Skindex-16: Responses were transformed to a linear scale ranging from 0 (never bothered) to 100 (always bothered). Final scores were averaged across three domains: symptoms, emotions, and functioning [14].

***Statistical analysis:*** Data were coded systematically and analyzed using the Statistical Package for Social Sciences (SPSS), version 23.0 (IBM Corp., Chicago, IL). Descriptive statistics permitted summation of demographic features and occurrence of side effects. Both Kolmogorov-Smirnov and Shapiro-Wilk tests were used to test the normality of continuous measures. Internal consistency of the measurement tools was tested using Cronbach's alpha (CADI = 0.792; Skindex-16 = 0.771). Inferential statistical analysis was accomplished with Independent T-tests and One-Way ANOVA wherever required. A p-value of $<0.05$ was regarded as statistically significant

***Ethical considerations:*** This research was carried out in accordance with the standards specified in the Declaration of Helsinki. Ethical clearance was gained from the University of Khartoum Faculty of Pharmacy Ethics Committee (FPEC-04-2023). Signed written informed consent was taken from all the participants. Confidentiality was ensured by stripping all personal identifiers from the data.

## Results

***Participant Characteristics:*** A total of 62 patients currently using oral isotretinoin for the treatment of acne vulgaris were enrolled in the study. The majority were in the 20–30 years age group (72.6%), followed by 30–40 years (17.7%) and those under 20 years (9.7%). Females constituted a higher proportion of the sample (77.4%) compared to males (22.6%) (Table 1).

Regarding the severity of acne, 62.9% of the patients presented with severe acne and 37.1% with moderate acne. Most of the patients (85.5%) were taking a daily isotretinoin dose of 20 mg, and the remaining (14.5%) were taking 40 mg daily. Half of the patients (50%) were taking isotretinoin for 1–3 months, and 27.4% and 22.6% were taking it for 4–5 months and 6–8 months, respectively. Most of the patients (62.9%) were taking once daily (OD) dosing, followed by twice daily (BD) at 32.3%, and thrice daily (TDS) at 4.8%.

Side Effects Associated with Oral Isotretinoin: A range of systemic and mucocutaneous side effects have been reported (Table 2). The most frequent side effects were xerostomia (95.2%), xerosis (93.5%), and an increased sensation of thirst (82.3%). Cheilitis (53.2%), myalgia (46.8%), headaches (45.2%), and alopecia (40.3%) were also seen with high frequency (Table 2).

Other significant side effects were fatigue (33.9%), dry eyes (30.6%), increased appetite (29.0%), and lethargy and pruritus (27.4% each), and epistaxis (24.2%). Gastrointestinal symptoms of anorexia (22.6%), nausea (17.7%), and vomiting (4.8%) occurred with less frequency. Additionally, laboratory abnormalities in the form of elevated liver enzymes, creatine phosphokinase (CPK), and platelet count occurred in 1.6% of the patients, and hypercholesterolemia and reduced levels of HDL were each noted in 3.2% (Table 2).

**Quality of Life and Psychosocial Impact**

Skindex-16: Descriptive statistics for the Skindex-16 subscales were mean scores of 44% (symptoms), 49% (emotion), and 35% (functioning). The overall mean Skindex-16 score was 44%, indicating a moderate effect on health-related quality of life (Table 3). Analysis of individual Skindex-16 items showed that 59.7% of patients were often bothered by their skin and 74.2% were annoyed. Emotionally, 59.7% were bothered by how they looked, and 56.5% were embarrassed. Functionally, 53.2% were bothered by interference with social relations, and 51.6% had a decreased desire to be with people (Table 4).

Cardiff Acne Disability Index (CADI): The average CADI score was 7 ± 3, and the median was 7, of 15, indicating an intermediate degree of disability (Table 3). Approximately 29% of the subjects were "very much" frustrated, aggressive, or embarrassed. Moreover, 25.8% stated acne to significantly affect social relationships and interactions. Approximately 19.4% were "very depressed and miserable" regarding their appearance, and 38.7% considered their acne a "minor problem" (Table 5).

Associations of Sociodemographic with Quality of Life and Psychosocial Impact: None of most of the domains addressed by both the Skindex-16 and the CADI scores revealed any statistically significant difference on testing against gender, age group, acne severity, isotretinoin dose, frequency of administration, delivery timing, or compliance (Table 6). Nevertheless, there were some significant deviations noted in functioning of the Skindex-16, where considerably greater impairment was reported by the patients with severe acne ($p = 0.021$), and by those who did not persist with ongoing isotretinoin treatment ($p = 0.018$). Moreover, significant differences in functioning scores were also observed based on the regimen of tablet administration ($p = 0.015$), with the most impairment observed for those who had taken the drug with meals and at bedtime. No correlations, however, were observed between the other Skindex-16 domains and the total CADI scores and the sociodemographic and treatment-related factors ($p > 0.05$) (Table 6).

**Table 1: Distribution of Sociodemographic data, acne types/ Dose, duration, frequency of use of isotretinoin therapy (n= 62)**

| Group | Number | Percent % |
|---|---|---|
| **Age groups** | | |
| Less than 20 years | 6 | 9.7 |
| 20-30 years | 45 | 72.6 |
| 30-40 years | 11 | 17.7 |
| **Gender** | | |
| Female | 48 | 77.4 |
| Male | 14 | 22.6 |
| **Types of acne** | | |
| Moderate | 23 | 37.1 |
| Severe | 39 | 62.9 |
| **Isotretinoin dose/ day** | | |
| 20mg | 53 | 85.5 |
| 40mg | 9 | 14.5 |
| Total | 62 | 100 |
| **Duration of Isotretinoin drug/ month** | | |
| (1-3) | 31 | 50 |
| (4-5) | 17 | 27.4 |
| (6-8) | 14 | 22.6 |
| **Frequency of dose/day** | | |
| OD | 39 | 62.9 |
| BD | 20 | 32.3 |
| TDS | 3 | 4.8 |
| Total | 62 | 100 |

**Table 2: The side effects of oral Isotretinoin that occurs in acne vulgaris patients (n 62)**

| Side effects of oral Isotretinoin | Number | Percent % |
|---|---|---|
| Xerostomia | 59 | 95.2% |
| Xerosis | 58 | 93.5% |
| Thirst | 51 | 82.3% |
| Cheilitis | 33 | 53.2% |
| Muscle ache | 29 | 46.8% |
| Headache | 28 | 45.2% |
| Thinning of hair | 25 | 40.3% |
| Dry nose | 26 | 41.9% |
| Fatigue | 21 | 33.9% |
| Dry eyes | 19 | 30.6% |
| Increase appetite | 18 | 29% |
| Lethargy | 17 | 27.4% |
| Pruritis | 17 | 27.4% |
| Darkening of the skin | 16 | 25.8% |
| Epistaxis | 15 | 24.2% |
| Anorexia | 14 | 22.6% |
| Nausea | 11 | 17.7% |
| Rash | 8 | 12.9% |
| Scar | 6 | 9.7% |
| Hyper triglyceride | 3 | 4.8% |
| Irregular menstrual cycle | 3 | 4.8% |
| Constipation | 3 | 4.8% |
| Vomiting | 3 | 4.8% |
| Skin infection | 3 | 4.8% |
| Decrease HDL | 2 | 3.2% |
| Hypercholesterolemia | 2 | 3.2% |
| Increase platelet count | 1 | 1.6% |
| Fading color | 1 | 1.6% |
| Swollen limbs | 1 | 1.6% |
| Decrease leukocyte and erythrocyte count | 1 | 1.6% |
| Increase elevated liver function tests (LFT) | 1 | 1.6% |
| Increase creatine phosphokinase (CPK) | 1 | 1.6% |

**Table 3: Summary of Impact on Quality of Life and Psychological Domains (Skindex-16 and Cardiff Index)**

| Instrument | Domain | Median (%) | Mean (%) | Standard Deviation (%) |
|---|---|---|---|---|
| **Skindex-16** | Symptoms | 50 | 44 | 39 |
| | Emotion | 43 | 49 | 30 |
| | Functioning | 40 | 35 | 33 |
| | **Total Score** | 44 | 44 | 23 |
| **Cardiff Acne Disability Index** | Total Score | 7 | 7 | 3 |

**Table 4. Frequencies of Skindex-16 Item Responses (n= 64)**

| Domain | Item | Number (%) | |
|---|---|---|---|
| | | **Always Bothered** | **Never Bothered** |
| **Symptoms** | Itching | 27 (43.5) | 35 (56.5) |
| | Burning or stinging | 29 (46.8) | 33 (53.2) |
| | Hurting | 17 (27.4) | 45 (72.6) |
| | Being irritated | 37 (59.7) | 25 (40.3) |
| **Emotion** | Persistence/reoccurrence | 23 (37.1) | 39 (62.9) |
| | Worry | 25 (40.3) | 37 (59.7) |
| | Appearance concern | 37 (59.7) | 25 (40.3) |
| | Frustration | 22 (35.5) | 40 (64.5) |
| | Embarrassment | 35 (56.5) | 27 (43.5) |
| | Being annoyed | 46 (74.2) | 16 (25.8) |
| | Feeling depressed | 24 (38.7) | 38 (61.3) |
| **Functioning** | Interactions with others | 33 (53.2) | 29 (46.8) |
| | Desire to be with people | 32 (51.6) | 30 (48.4) |
| | Hard to show affection | 24 (38.7) | 38 (61.3) |
| | Daily activities | 12 (19.4) | 50 (80.6) |
| | Hard to work or enjoy activities | 8 (12.9) | 54 (87.1) |

**Table 5. Frequencies of Cardiff Acne Disability Index Item Responses (n= 62)**

| Cardiff Acne Disability Index variables | Number | Percent |
|---|---|---|
| **Aggressive, frustrated, or embarrassed** | | |
| Very much indeed | 18 | 29 |
| A lot | 8 | 12.9 |
| A little | 23 | 37.1 |
| Not at all | 13 | 21 |
| **Interfered with social life, social events, and relationship with others of the opposite sex** | | |
| Severely | 16 | 25.8 |
| Moderately | 16 | 25.8 |
| Occasionally | 14 | 22.6 |
| Not at all | 16 | 25.8 |
| **Avoiding public changing facilities or wearing swimming costumes** | | |
| All of the time | 6 | 9.7 |
| Most of the time | 10 | 16.1 |
| Occasionally | 31 | 50 |
| Not at all | 15 | 24.2 |
| **Feelings about the appearance of the skin during the last month** | | |
| Very depressed and miserable | 12 | 19.4 |
| Usually concerned | 20 | 32.3 |
| Occasionally concerned | 25 | 40.3 |
| Not bothered | 5 | 8.1 |
| **Currently thinking about how bad is acne** | | |
| The worst | 3 | 4.8 |
| A major problem | 9 | 14.5 |
| A minor problem | 24 | 38.7 |
| Not a problem | 26 | 41.9 |

**Table 6: Significant Associations Between Impact Scores and Sociodemographic/Clinical Variables**

| **Independent T-Test Results** | | | |
|---|---|---|---|
| **Score** | **Variable** | **Significance (p-value)** | **Interpretation** |
| **Skindex-16 Functioning** | Type of acne (moderate/severe) | 0.021 **(significant)** | More impairment with severe acne |
| | Tablet regularity (yes/no) | 0.018 **(significant)** | More impairment in irregular users |

| | | | |
|---|---|---|---|
| **Other Skindex-16 domains** | All other variables | $p > 0.05$ | Not statistically significant |
| **Cardiff Acne Index** | All sociodemographic variables | $p > 0.05$ | No significant differences |
| **One-Way ANOVA Results** | | | |
| **Score** | **Variable** | **Significance (p-value)** | **Interpretation** |
| **Skindex-16 Functioning** | Tablet pattern (meals/empty/bed) | 0.015 **(significant)** | Significant differences among patterns |
| **Other domains** | Age, dose frequency, pattern | $p > 0.05$ | Not statistically significant |
| **Cardiff Acne Index** | All variables | $p > 0.05$ | Not statistically significant |

## Discussion

The present study is a comprehensive assessment of the clinical, psychosocial, and quality-of-life impacts of oral isotretinoin treatment in Sudanese acne vulgaris patients. Most were adults between 20–30 years, with a high female preponderance (77.4%). The demographic profile is consistent with global patterns, where women attend dermatologic clinics more often owing to greater concern with appearance and psychosocial implications of acne [15,16]. Similar results were reported in a study, where acne was most prevalent in the 20–29 year age group and more likely to be reported by women [17]. Our group might underrepresent individuals aged <20 years because of the reticence in using isotretinoin in adolescents owing to its known side effect profile.

The vast majority (85.5%) of the subjects received a daily isotretinoin dose of 20 mg/day, which is in line with low-dose protocols described in the literature as having effectiveness with reduced side effects [5,7]. One prospective study showed that 90% of acne patients were treated with 20 mg/day for three months had favorable outcomes, minimal side effects and reduced expenses when compared with higher dose regimens of oral isotretinoin [18].

Mucocutaneous side effects were extremely frequent and most frequent among them were xerostomia (95.2%), xerosis (93.5%), and thirst (82.3%). This agrees with a large retrospective study conducted in Romania and Poland, which reported similar xerostomia incidence (100%) and xerosis (94.97%) [9]. The side effects are primarily due to the inhibition of sebaceous gland activity by isotretinoin and its influence on the stratum corneum and skin barrier [19]. Cheilitis, another signature side effect, occurred in 53.2% of the subjects-lower than in certain regions (e.g., 94% in Brazil), likely due to climatic or ethnic reasons [20]. Thirst was frequent and possibly compounded by the warm ambient temperature in Sudan. Although mucocutaneous symptoms were frequent, they were generally manageable with supportive care (e.g., moisturizers, fluid, and lip lubrication) [21]. Furthermore, epistaxis was seen in 24.2% of patients, a frequency in agreement with other reports blaming this symptom on dryness and thinning of nasal mucosae [10].

Systemic side effects were headache (45.2%) and myalgia (46.8%), higher frequencies than in certain previous reports possibly due to heterogeneity of patients or reporting practices [22,23]. Pathophysiology of the musculoskeletal symptoms may involve increased matrix metalloproteinase (MMP-2) activity, with impact on joint and muscle tissues [24]. Gastrointestinal adverse effects were not common but heterogeneous. Increased appetite (29%) was more common than anorexia (22.6%), which reflects the heterogeneous metabolic responses to isotretinoin. Regulation by factors such as leptin or psychological state may influence change in appetite [25,26].

Notably, in this study, no depression or significant psychological changes was correlated with the administration of isotretinoin. The CADI and Skindex-16 scores indicated moderate psychosocial effects were occurred, but without statistical associations with isotretinoin or demographic variables. These results corroborate the supposition that, for several patients, the clinical condition improvement in acne lessens psychological distress, as evident in numerous research studies [27,28]. Nonetheless, an FDA two-decade report (1997-2017) identified more than 17,000 psychiatric side effects of isotretinoin, stressing monitoring and individualized evaluation [11]. Although, we did not find this association in the current study, clinicians need to be attentive, particularly for acne patients with prior mood disorders.

Adherence issues were also seen. About 9.7% had irregular use, and 8.1% discontinued therapy-rates comparable to those of international observational studies [29-31]. Several reasons contributed to low adherence including cost of the medicine, side effects, and unavailability of isotretinoin in Sudanese pharmacies [32]. Skindex-16 and CADI scores indicated that moderate to severe psychosocial impairment, particularly in the functional emotional and domains. Frustration, embarrassment, and social withdrawal were observed in 50% of the participants, these findings are in line with a previous report [33]. Skindex-16 functioning scores were correlated with many factors including severe acne ($p = 0.021$), non-adherence ($p = 0.018$), and dose regimens ($p = 0.015$). These findings suggest that severity of disease and adherence to treatment affecting patients' psychological and social functioning more than sociodemographic characteristics.

The current study has several limitations, firstly the cross-sectional study design hinders comparison of causal relationships and following change over time. Secondly, the purposive sampling strategy and small sample size may limit generalizability of findings and may have imposed selection bias. Thirdly, relying on self-reported data also introduces recall and reporting biases. Finally, the absence of a control group complicates the ability to distinguish between the psychological effect of isotretinoin and acne itself. In spite these limitations, the current study is its broad and multidimensional perspective, using proven instruments (Skindex-16 and CADI) to measure both the dermatological and psychosocial effects of isotretinoin treatment. Performed in actual clinical practice in Khartoum, it provides locally applicable results, with close analysis of treatment parameters such as dosing, duration, and compliance.

In conclusion, the findings of this study demonstrated a high incidence of mucocutaneous side effects and moderate psychosocial morbidity, particularly in relation to emotional and functional domains of daily life. Functional impairment was strongly associated with severity of acne, poor compliance with medication, and timing of use. These findings highlight the requirement for a comprehensive model of acne management that includes, in addition to clinical monitoring of side effects, regular assessment of mental health and quality of life. The addition of psychological counseling and adherence enhancement to the treatment of acne can improve both clinical and psychosocial outcomes.

## Declarations

## Ethical Clearance

This research was carried out in accordance with the standards specified in the Declaration of Helsinki. Ethical clearance was

gained from the University of Khartoum Faculty of Pharmacy Ethics Committee (FPEC-04-2023). Signed written informed consent was taken from all the participants. Confidentiality was ensured by stripping all personal identifiers from the data.

## Acknowledgements

None

## Conflict of interest

The authors declare that there is no conflict of interest.

## Funding/ financial support

This study received no specific grant from any funding agency in the public, commercial or not for profit sector.

## Contributors

IAM and FSN: Conceptualization, Methodology, Investigation, Data collection and curation, Writing original draft, MAM and EAAE: Conceptualization, Methodology, Formal analysis, Data curation, Visualization. MHA and KOA: Data analysis, Software, Writing – review and editing. BAY: Supervision, Formal analysis, Data collection and curation, Writing – review and editing. All authors approved the final manuscript

## References

[1] Vasam M, Korutla S, Bohara RA. Acne vulgaris: A review of the pathophysiology, treatment, and recent nanotechnology based advances. Biochem Biophys Rep. 2023;36:101578. https://doi.org/10.1016/j.bbrep.2023.101578

[2] Sutaria AH, Masood S, Saleh HM, *et al*. Acne Vulgaris. (Updated 2023 Aug 17). In: StatPearls (Internet). Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459173/

[3] Bae IH, Kwak JH, Na CH, Kim MS, Shin BS, Choi H. A Comprehensive Review of the Acne Grading Scale in 2023. Ann Dermatol. 2024;36(2):65-73. doi: 10.5021/ad.23.094.

[4] Kraft J, Freiman A. Management of acne. CMAJ. 2011;183(7):E430-5. https://doi.org/10.1503/cmaj.090374

[5] Reynolds RV, Yeung H, Cheng CE, Cook-Bolden F, Desai SR, Druby KM, Freeman EE, Keri JE, Stein Gold LF, Tan JKL, Tollefson MM, Weiss JS, Wu PA, Zaenglein AL, Han JM, Barbieri JS. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol. 2024;90(5):1006.e1-1006.e30. https://doi.org/10.1016/j.jaad.2023.12.017

[6] Paichitrojjana A, Paichitrojjana A. Oral Isotretinoin and Its Uses in Dermatology: A Review. Drug Des Devel Ther. 2023;17:2573-2591. https://doi.org/10.2147/DDDT.S427530

[7] Pile HD, Patel P, Sadiq NM. Isotretinoin. (Updated 2025 Mar 4). In: StatPearls (Internet). Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK525949/

[8] Layton A. The use of isotretinoin in acne. Dermatoendocrinol. 2009;1(3):162-9. https://doi.org/10.4161/derm.1.3.9364

[9] Brzezinski P, Borowska K, Chiriac A, Smigielski J. Adverse effects of isotretinoin: A large, retrospective review. Dermatol Ther. 2017;30(4). https://doi.org/10.1111/dth.12483

[10] Kapała J, Lewandowska J, Placek W, Owczarczyk-Saczonek A. Adverse Events in Isotretinoin Therapy: A Single-Arm Meta-Analysis. Int J Environ Res Public Health. 2022;19(11):6463. https://doi.org/10.3390/ijerph19116463

[11] Singer S, Tkachenko E, Sharma P, Barbieri JS, Mostaghimi A. Psychiatric Adverse Events in Patients Taking Isotretinoin as Reported in a Food and Drug Administration Database From 1997 to 2017. JAMA Dermatol. 2019;155(10):1162-1166. https://doi.org/10.1001/jamadermatol.2019.1416

[12] Rajput I, Anjankar VP. Side Effects of Treating Acne Vulgaris with Isotretinoin: A Systematic Review. Cureus. 2024;16(3):e55946. https://doi.org/10.7759/cureus.55946

[13] Motley RJ, Finlay AY. Practical use of a disability index in the routine management of acne. Clin Exp Dermatol. 1992;17(1):1-3. https://doi.org/10.1111/j.1365-2230.1992.tb02521.x

[14] Chren MM, Lasek RJ, Quinn LM, Mostow EN, Zyzanski SJ. Skindex, a quality-of-life measure for patients with skin disease: reliability, validity, and responsiveness. J Invest Dermatol. 1996;107(5):707-13. https://doi.org/10.1111/1523-1747.ep12365600

[15] Tan YJ, Jamil A, Gunabalasingam P. Disease perception, treatment-seeking behaviour and psychosocial impact of acne vulgaris among university students - A cross-sectional study. Malays Fam Physician. 2025;20:3. https://doi.org/10.51866/oa.622

[16] Abu Taleb R, Hannani H, Mojiri ME, Mobarki OA, Daghriri SA, Mosleh AA, Mongri AO, Farji JS, Alzahrani AA, Safhi AM, Farhan OA. Prevalence and Patterns of Cosmetic Dermatological Procedures in Jazan, Saudi Arabia: A Cross-Sectional Study. Cureus. 2024;16(10):e71223. https://doi.org/10.7759/cureus.71223

[17] Collier CN, Harper JC, Cafardi JA, Cantrell WC, Wang W, Foster KW, Elewski BE. The prevalence of acne in adults 20 years and older. J Am Acad Dermatol. 2008;58(1):56-9. https://doi.org/10.1016/j.jaad.2007.06.045

[18] Rao PK, Bhat RM, Nandakishore B, Dandakeri S, Martis J, Kamath GH. Safety and efficacy of low-dose isotretinoin in the treatment of moderate to severe acne vulgaris. Indian J Dermatol. 2014;59(3):316. https://doi.org/10.4103/0019-5154.131455

[19] Gencebay G, Aşkın Ö, Serdaroğlu S. Evaluation of the changes in sebum, moisturization and elasticity in acne vulgaris patients receiving systemic isotretinoin treatment. Cutan Ocul Toxicol. 2021;40(2):140-144. https://doi.org/10.1080/15569527.2021.1922434

[20] Brito Mde F, Sant'Anna IP, Galindo JC, Rosendo LH, Santos JB. Evaluation of clinical adverse effects and laboratory alterations in patients with acne vulgaris treated with oral isotretinoin. An Bras Dermatol. 2010;85(3):331-7. https://doi.org/10.1590/s0365-05962010000300006

[21] Reyes-Hadsall S, Ju T, Keri JE. Use of Oral Supplements and Topical Adjuvants for Isotretinoin-Associated Side Effects: A Narrative Review. Skin Appendage Disord. 2024;10(1):1-9. https://doi.org/10.1159/000533963

[22] Alli N, Yorulmaz A. An unusual side effect of isotretinoin: retinoid dermatitis affecting external urethral meatus. Cutan Ocul Toxicol. 2015;34(2):176-7. https://doi.org/10.3109/15569527.2014.918140

[23] Karaosmanoğlu N, Mülkoğlu C. Analysis of musculoskeletal side effects of oral Isotretinoin treatment: a cross-sectional study. BMC Musculoskelet Disord. 2020;21(1):631. https://doi.org/10.1186/s12891-020-03656-w

[24] Acar EM, Şaş S, Koçak FA. Evaluation of musculoskeletal adverse effects in patients on systemic isotretinoin treatment: A cross-sectional study. Arch Rheumatol. 2021;37(2):223-229. https://doi.org/10.46497/ArchRheumatol.2022.8645

[25] Karadag AS, Ertugrul DT, Takci Z, Bilgili SG, Namuslu M, Ata N, Sekeroglu R. The effect of isotretinoin on retinol-binding protein 4, leptin, adiponectin and insulin resistance in acne vulgaris patients. Dermatology. 2015;230(1):70-4. https://doi.org/10.1159/000367687

[26] Cemil BC, Ayvaz HH, Ozturk G, Ergin C, Akıs HK, Gonul M, Arzuhal E. Effects of isotretinoin on body mass index, serum adiponectin, leptin, and ghrelin levels in acne vulgaris patients. Postepy Dermatol Alergol. 2016;33(4):294-9. https://doi.org/10.5114/pdia.2016.56928

[27] Šimić D, Penavić JZ, Babić D, Gunarić A. Psychological Status and Quality of Life in Acne Patients Treated with Oral Isotretinoin. Psychiatr Danub. 2017;29(Suppl 2):104-110.

[28] Kaymak Y, Taner E, Taner Y. Comparison of depression, anxiety and life quality in acne vulgaris patients who were treated with either isotretinoin or topical agents. Int J Dermatol. 2009;48(1):41-6. https://doi.org/10.1111/j.1365-4632.2009.03806.x

[29] Al-Hawamdeh MI, Al-Ameri M, Lutfi S, Muhtaseb N, Takhayneh R, Awamreh T. Knowledge, Attitude, and Risk Perception in Oral Isotretinoin Use: A Cross-Sectional Study from Jordan. Dermatol Res Pract. 2024;2024:7714527. https://doi.org/10.1155/2024/7714527

[30] Dréno B, Thiboutot D, Gollnick H, Finlay AY, Layton A, Leyden JJ, Leutenegger E, Perez M; Global Alliance to Improve Outcomes in Acne. Large-scale worldwide observational study of adherence with acne therapy. Int J Dermatol. 2010;49(4):448-56. https://doi.org/10.1111/j.1365-4632.2010.04416.x

[31] Jakobi AU, Bircher AJ, Pagnamenta A, Terrani I. Isotretinoin Concerns in Switzerland: A Student-Based Transversal Study. J Clin Med. 2025;14(6):1801. https://doi.org/10.3390/jcm14061801

[32] Ibrahim S, Osman B, Awaad RM, Abdoon I. Acne Vulgaris Relapse in Sudanese Patients Treated with Oral Isotretinoin: Rate and Predictive Factors. J Multidiscip Healthc. 2023;16:839-849. https://doi.org/10.2147/JMDH.S405509

[33] Secrest AM, Hopkins ZH, Frost ZE, Taliercio VL, Edwards LD, Biber JE, Chen SC, Chren MM, Ferris LK, Kean J, Hess R; Dermatology PRO Consortium. Quality of Life Assessed Using Skindex-16 Scores Among Patients with Acne Receiving Isotretinoin Treatment. JAMA Dermatol. 2020;156(10):1098-1106. https://doi.org/10.1001/jamadermatol.2020.2330