MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY STATE UNIVERSITY
ACADEMIC AND RESEARCH MEDICAL INSTITUTE

Eastern Ukrainian Medical Journal

116, Kharkivska st., Sumy 40007, Ukraine eumj.med.sumdu.edu.ua
e-mail: eumj@med.sumdu.edu.ua ISSN: 2663-5909 (print)/2664-4231 (online)

How to cite: Qoqazy BAS, Melekhovets OK. Assessment of the Clinical Efficacy and Safety of Long-Pulsed Neodymium (1064-nm) Laser Therapy Versus Standard Medical Therapy in Moderate Acne Vulgaris. *East Ukr Med J.* 2025;13(4):1041-1051. https://doi.org/10.21272/eumj.2025;13(4);1041-1051

ABSTRACT

Belal A. S. Qoqazy
https://orcid.org/0009-0003-8012-0255
Department of Internal and Family Medicine, Dermatovenereology, Sumy State University, Ukraine

Oksana K. Melekhovets
https://orcid.org/0000-0001-9031-7009
Department of Internal and Family Medicine, Sumy State University, Sumy, Ukraine

ASSESSMENT OF THE CLINICAL EFFICACY AND SAFETY OF LONG-PULSED NEODYMIUM (1064-NM) LASER THERAPY VERSUS STANDARD MEDICAL THERAPY IN MODERATE ACNE VULGARIS

Introduction. Moderate acne vulgaris represents a long-standing inflammatory condition of the pilosebaceous unit, in which visible lesions on the face and trunk markedly impair self-image and emotional well-being. Conventional combined medical therapy is widely used but often shows slow onset of action, long treatment duration, and adverse effects, which reduces patient adherence. These limitations have stimulated interest in non-pharmacological approaches. Long-Pulsed Neodymium (1064-nm) Laser Therapy offers targeted photothermal effects on sebaceous structures and inflammatory pathways with minimal downtime.

Aim. To evaluate the anti-inflammatory effect, clinical improvement, patient satisfaction, overall tolerability, and the potential reduction of treatment-related adverse effects achieved with long-pulsed 1064-nm neodymium laser therapy compared with Standard Medical Therapy in moderate acne vulgaris.

Materials and Methods. This prospective randomized clinical trial included 80 adults aged 18–40 years diagnosed with moderate acne vulgaris. Participants were evenly allocated into two study arms (n = 40 per group; 15 males and 25 females). Group 1 (Standard Medical Therapy) received a guideline-based regimen consisting of nightly topical benzoyl peroxide (5%–10%) combined with adapalene (0.1%–0.3%), as well as oral doxycycline administered within standard therapeutic limits (100–200 mg/day). All medication choices and dosages adhered to contemporary evidence-based recommendations for moderate acne management. Group 2 (Laser therapy) underwent six treatment sessions delivered at two-week intervals using a long-pulse 1064-nm Nd:YAG laser. The procedure employed clinically appropriate

low-to-moderate fluence, an intermediate pulse duration, and a medium spot size, in line with established non-ablative acne treatment protocols. Dynamic epidermal cooling and individualized energy adjustments were implemented to ensure both patient safety and optimal therapeutic effect. Clinical severity was evaluated using the Global Acne Grading Scale (GAGS) at baseline, week 6, and week 12. Satisfaction levels were documented using a numerical visual analogue rating scale ranging from 0 to 10, and all local skin reactions were systematically recorded throughout the study period.

Results. Baseline characteristics showed no significant differences ($p = 0.87$). Both groups improved by week 6 ($p<0.05$), with a more pronounced reduction in GAGS scores in the laser group ($p = 0.035$). By week 12, mean GAGS scores were lower with laser therapy (11.8 ± 2.5) than with medical therapy (14.6 ± 2.8; $p = 0.007$). VAS satisfaction scores were higher in the laser group (8.3 ± 0.8 vs. 6.7 ± 0.9; $p = 0.004$).Adverse effects were mild: transient erythema (12.5%) and slight edema (10%) resolved within 48 hours. Medical therapy caused dryness (20%) and irritation (17.5%). No pigment changes or scarring occurred in either group.

Conclusion. Long-pulse 1064-nm Nd:YAG laser therapy provided stronger clinical improvement, higher patient satisfaction, and fewer persistent adverse effects compared with combined topical–systemic therapy. It represents an effective, well-tolerated option for moderate acne.

Keywords: moderate acne; Nd:YAG 1064-nm; long-pulse modality; laser treatment; severity scoring; GAGS index; VAS rating; therapeutic response; treatment efficacy; safety profile.

Corresponding author: *Belal A. S. Qoqazy, Department of Internal and Family Medicine, Dermatovenereology, Sumy State University, Ukraine*
E-mail: dr.belalqoqazy85@gmail.com

РЕЗЮМЕ

Белаль Аввад Салім Коказі
https://orcid.org/0009-0003-8012-0255
Аспірант зі спеціальності «Дерматовенерологія», кафедра внутрішньої та сімейної медицини, дерматовенерології, Сумський державний університет, Україна

Оксана К. Мелеховець
https://orcid.org/0000-0001-9031-7009
Кандидат медичних наук, професор, професор кафедри внутрішньої та сімейної медицини, Сумський державний університет, Суми, Україна

ОЦІНКА КЛІНІЧНОЇ ЕФЕКТИВНОСТІ ТА БЕЗПЕКИ ТЕРАПІЇ ДОВГОІМПУЛЬСНИМ НЕОДИМОВИМ ЛАЗЕРОМ (1064 НМ) ПОРІВНЯНО ЗІ СТАНДАРТНОЮ МЕДИЧНОЮ ТЕРАПІЄЮ ПРИ АКНЕ СЕРЕДНЬОГО СТУПЕНЯ ТЯЖКОСТІ

Вступ. Помірний акне вульгарис є хронічним запальним захворюванням пілосебацейного апарату, при якому наявність видимих уражень на обличчі та тулубі істотно впливає на самооцінку та психоемоційний стан пацієнтів. Традиційна комбінована медикаментозна терапія залишається поширеним методом лікування, проте часто характеризується повільним початком дії, тривалістю курсу та виникненням побічних ефектів, що знижує прихильність до лікування. Ці обмеження сприяли підвищенню інтересу до нефракційних немедикаментозних методів. Довгоімпульсна неодимова лазерна терапія (1064 нм) забезпечує цілеспрямований фототермальний вплив на сальні залози та запальні елементи з мінімальним періодом відновлення.

Мета. Оцінити протизапальний ефект, клінічне покращення, рівень задоволеності пацієнтів, загальну переносимість та можливе зниження частоти побічних реакцій при застосуванні довгоімпульсного неодимового лазера 1064 нм порівняно зі

стандартною медикаментозною терапією у пацієнтів із помірним акне вульгарис.

Матеріали та методи. У проспективне рандомізоване клінічне дослідження включено 80 дорослих пацієнтів віком 18–40 років із діагностованим помірним акне вульгарис. Учасники були рівномірно розподілені на дві групи (n = 40 у кожній; 15 чоловіків та 25 жінок). Група 1 (Стандартна терапія): нічне нанесення бензоїлпероксиду (5–10%) у комбінації з адапаленом (0,1–0,3%), а також пероральний доксициклін у стандартній терапевтичній дозі (100–200 мг/добу). Схема лікування відповідала сучасним доказовим клінічним рекомендаціям. Група 2 (лазерна терапія): шість процедур з інтервалом у два тижні із застосуванням довгоімпульсного Nd:YAG лазера 1064 нм. Використовували низькі та середні рівні флюенсу, середню тривалість імпульсу та середній розмір плями згідно зі стандартними неабляційними протоколами. Застосовувалося динамічне епідермальне охолодження та індивідуальне регулювання параметрів.Тяжкість акне оцінювали за шкалою GAGS на початку, на 6-му та 12-му тижнях. Рівень задоволеності визначався за візуальною аналоговою шкалою (0–10). Усі локальні реакції шкіри фіксували протягом усього дослідження.

Результати. Початкові характеристики між групами суттєво не відрізнялися ($p = 0,87$). Обидві групи продемонстрували покращення на 6-му тижні ($p < 0,05$), хоча зниження показників GAGS було більш вираженим у групі лазерної терапії ($p = 0,035$). На 12-му тижні середній бал GAGS становив 11,8 ± 2,5 у групі Nd:YAG лазера порівняно з 14,6 ± 2,8 у групі медикаментозного лікування ($p = 0,007$).Показники задоволеності також були вищими в групі лазерної терапії (8,3 ± 0,8 проти 6,7 ± 0,9; $p = 0,004$). Побічні реакції були легкими: транзиторна еритема (12,5%) та незначний набряк (10%), що зникали протягом 48 годин. У групі медикаментозної терапії найчастіше спостерігали сухість шкіри (20%) та подразнення (17,5%). Пігментних змін чи рубцювання не зафіксовано в жодній групі.

Висновки. Довгоімпульсний Nd:YAG лазер 1064 нм продемонстрував більш виражене клінічне покращення, вищий рівень задоволеності пацієнтів та меншу частоту стійких побічних реакцій порівняно зі стандартною комбінованою місцево–системною терапією. Цей метод є ефективним, безпечним і добре переносимим варіантом лікування помірного акне вульгарис.

Ключові слова: помірне акне; неодимовий лазер 1064 нм; довгоімпульсний режим; лазерна терапія; шкала тяжкості; індекс GAGS; оцінка результатів; ефективність; безпека.

***Автор, відповідальний за листування**: **Белаль Аввад Салім Коказі,** кафедра внутрішньої та сімейної медицини, дерматовенерології, Сумський державний університет, Україна*
E-mail: dr.belalqoqazy85@gmail.com

INTRODUCTION

Acne vulgaris is a complex inflammatory disorder of the pilosebaceous apparatus and continues to rank among the leading dermatological complaints encountered in everyday clinical practice worldwide. Epidemiological data suggest that approximately 80% of adolescents and young adults develop clinically significant acne, and in a substantial subset the condition persists or recurs well into adulthood [1]. Beyond its cutaneous manifestations, acne can exert a

substantial psychosocial burden, contributing to diminished self-esteem, social withdrawal, and emotional distress [2]. The pathogenesis of acne is multifactorial and includes excessive sebaceous gland activity with increased sebum production, abnormal follicular keratinization, proliferation of Cutibacterium acnes (formerly Propionibacterium acnes), and activation of inflammatory immune pathways [3]. These factors collectively generate a broad clinical spectrum, extending from initially non-inflamed comedonal changes to progressively inflammatory papular, pustular, and nodular forms, which in more advanced stages may ultimately result in permanent scarring. [4]. In routine practice, moderate acne vulgaris is treated mainly with combinations of topical and systemic medications, most commonly benzoyl peroxide, retinoid formulations, and oral antibiotics. Despite being considered standard of care, these regimens have several important limitations: clinical improvement often appears only after weeks of continuous use, treatment courses tend to be prolonged, and patients frequently experience cutaneous irritation, xerosis, gastrointestinal discomfort, and increasing concerns regarding antibiotic resistance. Together, these issues may reduce adherence and negatively influence overall treatment success [5, 6].

Growing interest has therefore shifted toward non-pharmacological modalities that address key pathogenic mechanisms while reducing the limitations associated with long-term drug exposure. Among these approaches, light- and energy-based technologies have attracted particular attention. Such systems selectively heat overactive sebaceous glands and induce controlled photothermal injury to inflammatory lesions through the mechanism of selective photothermolysis. By delivering targeted energy into the deeper dermal layers while largely sparing the epidermis, these devices can diminish inflammatory activity, reduce microbial colonization, stimulate collagen remodeling, and enhance overall skin quality [7, 8]. Notably, the long-pulse 1064-nm neodymium-doped laser platform (Nd:YAG) has demonstrated considerable potential in acne treatment. Owing to its deeper tissue penetration, this laser modality is well suited to targeting sebaceous glands and the vascular components that accompany inflammatory lesions. Multiple clinical studies have reported that therapy delivered via a 1064-nm Nd:YAG system can substantially decrease acne lesion counts, provide rapid recovery, and maintain a favorable safety profile. Furthermore, this laser-based modality offers a non-invasive adjunct or alternative to conventional pharmacologic regimens, potentially reducing the need for systemic medications and their associated side effects. Despite its increasing incorporation into clinical practice, there remains a lack of rigorous comparative studies that directly evaluate long-pulse neodymium-based 1064-nm laser treatment against standard topical therapeutic protocols. High-quality evidence is still required to define the precise therapeutic role of this modality in acne management and to optimize personalized treatment strategies for patients with moderate disease [9–11]. The present study seeks to compare the clinical efficacy, patient-reported satisfaction, and safety profile of a long-pulse 1064-nm Nd:YAG device–based treatment protocol with conventional topical medical therapy in individuals with moderate acne vulgaris. By assessing both objective clinical parameters and subjective patient experiences, this research aims to clarify the potential value of incorporating laser-assisted approaches into modern acne management algorithms.

Aim. To evaluate the anti-inflammatory effect, clinical improvement, patient satisfaction, overall tolerability, and the potential reduction of treatment-related adverse effects achieved with long-pulsed 1064-nm neodymium laser therapy compared with Standard Medical Therapy in moderate acne vulgaris**.**

MATERIALS AND METHODS

The present randomized controlled investigation formed part of the institutional research program at Sumy State University—“Study of comorbidities of non-communicable diseases to ensure a healthy lifestyle and promote the well-being of the population of different age groups” (registration No. 0121U114163; 01.22–11.26)—and was executed in collaboration with the Sumy Clinic of Laser Medicine in accordance with cooperation agreement No. 62.14-01.16-21/n. This prospective randomized controlled clinical study included 80 adult patients aged 18–40 years with clinically confirmed moderate acne vulgaris, all of whom were followed for a total of 12 weeks. Prior to enrollment, the study protocol, procedures, potential risks, and expected benefits were explained in detail, and each participant provided signed informed consent after receiving a comprehensive explanation. Ethical clearance for the trial was issued by the Local Bioethics Committee of Sumy State University (Protocol No. 1/09, September 8, 2025). The conduct of the study was fully consistent with the ethical standards outlined in the Declaration of Helsinki (2013 revision). Randomization allocated participants into two equal groups (n = 40 per group; 15 males and 25 females in each) using a computer-generated scheme to minimize selection bias. Baseline characteristics, including age, sex distribution, and acne severity measured using the Global Acne Grading System (GAGS), showed no

statistically significant differences. Inclusion criteria were: age 18–40 years, diagnosis of moderate acne vulgaris (GAGS score 19–30), absence of topical or systemic acne therapy within the previous four weeks, and willingness to comply with the study protocol. Exclusion criteria included severe acne (GAGS ≥ 30), pregnancy or lactation, hypersensitivity to study medications or laser exposure, acute dermatoses or infection in the treatment area, history of hypertrophic scarring, systemic isotretinoin use within six months, significant systemic illness, immune suppression, or inability to comply with study requirements. Group 1 (Standard Medical Therapy). Participants received a guideline-based regimen consisting of nightly benzoyl peroxide (5%–10%) combined with adapalene (0.1%–0.3%), along with oral doxycycline (100–200 mg/day). Group 2 (Laser Therapy). Participants underwent six treatment sessions at two-week intervals using a long-pulse 1064-nm neodymium-doped laser system. Procedures applied low- to medium-energy settings, intermediate pulse durations, and a medium spot size consistent with standard non-ablative acne protocols. Dynamic epidermal cooling and individualized energy adjustments were used to enhance safety and optimize therapeutic response. All participants received standardized recommendations for the prevention of dyschromia, including daily use of broad-spectrum sunscreen (SPF 50+), avoidance of direct sun exposure and tanning devices throughout the treatment period and for four weeks after the final procedure.

Outcome Measures. Acne severity was assessed using the Global Acne Grading System (GAGS) at baseline, week 6, and week 12. Patient satisfaction was recorded using a numerical visual analogue rating scale (0–10). All local cutaneous reactions, including erythema, edema, discomfort, or other transient events, were systematically documented throughout the study.

Statistical Analysis. Statistical processing was carried out using SPSS software, version 26.0 (IBM Corp., Armonk, NY, USA). Numerical variables were summarized as mean values with their corresponding standard deviations, whereas categorical parameters were described through frequency counts and percentage distributions. Comparisons between the two study groups were performed using appropriate independent-sample tests or ANOVA, while within-group dynamics were analyzed with paired t-tests. Chi-square tests were applied to examine categorical outcomes. A significance threshold of $p < 0.05$ was adopted for all analyses.

RESULTS

Over the 12-week observation period, both treatment arms demonstrated a steady and statistically confirmed reduction in acne severity according to the Global Acne Grading SCALE (GAGS). At baseline, the mean GAGS values were comparable between the two cohorts ($p = 0.87$), indicating that the randomization process successfully produced groups similar in age, sex distribution, and initial disease severity. Although improvement was recorded in both groups, patients receiving long-pulse 1064-nm neodymium-doped laser therapy showed a more rapid and pronounced decline in inflammatory lesions. By week 6, the laser cohort exhibited a significantly greater decrease in GAGS scores than participants treated with conventional pharmacologic therapy ($p = 0.035$). This therapeutic advantage became even more evident by week 12, when the laser-treated group demonstrated a substantially larger overall reduction in acne severity ($p = 0.007$) **(**Table 1).

Table 1. Dynamics of Global Acne Grading Scale (GAGS) Scores Across the Study Period

Time Point	Standard Medical Therapy (n = 40) Average ± SD (points)	Nd:YAG Laser (n = 40) Average ± SD (points)	Significance level (p)
Week 0	24.1 ± 3.8	24.0 ± 3.9	0.87
Week 6	19.5 ± 3.2	17.2 ± 3.1	0.035
Week 12	14.6 ± 2.8	11.8 ± 2.5	0.007

Explanation:

Scores are expressed as average values with standard deviation (SD).The Global Acne Grading Scale (GAGS) was used to assess acne severity at all time points. Between-group differences were analyzed using an independent-samples t-test. A significance level of $p < 0.05$ was considered statistically meaningful

In addition to objective improvements, subjective patient-reported outcomes also favored the laser modality. By week 12, satisfaction assessed using the 10-point Visual Analogue Scale (VAS) remained high in both groups; however, markedly higher scores were observed among individuals treated with the 1064-nm device (Table 2), reflecting superior perceived clinical and cosmetic benefit.

Table 2. Visual Analogue Scale Outcomes at Week 12

Group	Mean score ± SD	Probability value
Standard Medical Therapy	6.7 ± 0.9	
Nd:YAG Laser Therapy	8.3 ± 0.8	0.004

Explanation: *VAS refers to the Visual Analogue Scale used to quantify patient-reported satisfaction (0 indicating the lowest satisfaction and 10 indicating the highest). The values are expressed as the mean and standard deviation (Mean ± SD). Differences between the two groups were analyzed using an independent-samples t-test. A p-value below 0.05 was interpreted as statistically significant*

No serious adverse events occurred, and all participants completed the study. In the laser group, the most frequent reactions were short-lasting erythema (12.5%) and mild transient edema (10%), both resolving spontaneously within 24–48 hours without intervention. No pigmentary abnormalities or scarring were documented (Table 3). Conversely, participants receiving the combined topical–systemic regimen experienced more persistent, yet still mild and manageable, cutaneous side effects. Dryness was reported in 20.0% of patients and erythematous irritation in 17.5%, typically alleviated with non-comedogenic moisturizers. No pigmentary disturbances or scars were observed in this group as well (Table 4).

Table 3. Recorded Adverse Events Following Long-pulse neodymium-based laser (1064 nm) Therapy

Adverse Effect	Patients (n)	Percentage (%)	Duration	Resolution / Outcome
Transient erythema	5	12.5	24–48 hours	Resolved without intervention
Mild edema	4	10.0	24–48 hours	Resolved spontaneously
Increased pigmentation	0	0	—	No cases detected
Reduced pigmentation	0	0	—	No cases detected
Scarring	0	0	—	No cases detected

Explanation: *All adverse events were continuously monitored throughout the 12-week observation period. The data are presented as the number of affected participants (n) and their corresponding percentages (%) calculated from the total group of 40 patients. The only reactions reported were transient erythema and mild edema, both of which disappeared spontaneously within 24–48 hours and did not require any additional management. No cases of increased pigmentation, reduced pigmentation, or scar formation occurred in any participant. N/A — not applicable*

Table 4. Summary of Adverse Events Observed in the Standard Medical Therapy Cohort

Type of Adverse Event	Patients (n)	Percentage (%)	Duration	Management / Outcome
Mild skin dryness	8	20.0	Persisted throughout study	Controlled with moisturizers
Skin irritation	7	17.5	Persisted throughout study	Improved with moisturizers
Increased pigmentation	0	0	—	No cases detected
Reduced pigmentation	0	0	—	No cases detected
Scar formation	0	0	—	No cases detected

Explanation: *Adverse reactions were monitored continuously during the entire 12-week treatment period. Results are presented as absolute numbers (n) and percentages (%) calculated for the full sample of 40 participants. The most frequently reported reactions were mild skin dryness and erythematous irritation, both of which persisted but remained manageable with regular use of non-comedogenic moisturizers. No instances of Increased pigmentation, Reduced pigmentation, or scarring were detected in any patient. N/A — not applicable*

Statistical analysis confirmed significant improvement from baseline in both treatment arms by week 6 ($p < 0.05$). However, the group treated with the neodymium-based laser consistently demonstrated superior outcomes, with between-group differences already evident at week 6 and further increasing by week 12 ($p = 0.007$). Figure 1 illustrates the overall decline in acne severity across the study period. Figure 2 presents patient-reported satisfaction, showing notably higher VAS values in the laser-treated cohort. Mild and

self-limiting procedural reactions associated with the energy-based treatment are summarized in Figure 3, whereas the topical-therapy arm exhibited more prolonged, though non-serious, irritation. Neither group showed pigmentary changes or scar formation, confirming the favorable safety profile of both modalities. As demonstrated in Figure 4, the long-pulse 1064-nm neodymium laser provided clearly visible clinical improvement with reduction in inflammatory lesions. Figure 5 displays outcomes following 12 weeks of standard pharmacologic therapy (benzoyl peroxide, adapalene, doxycycline), which also resulted in clinical benefit, though to a lesser extent.

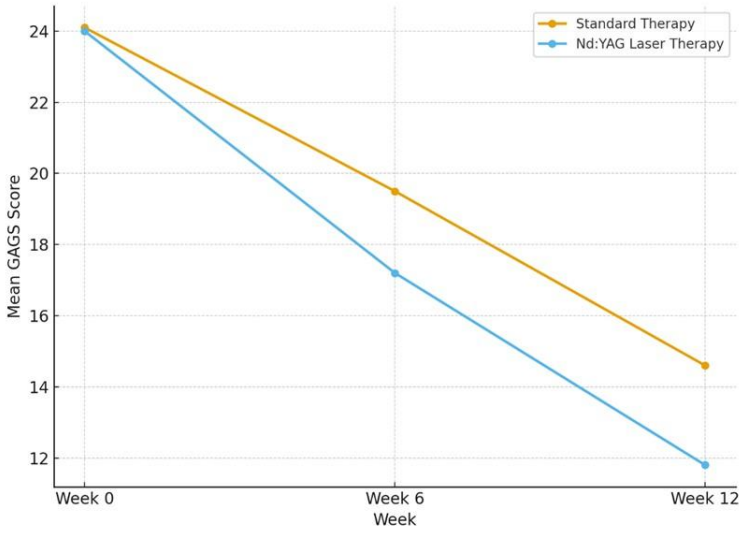

Figure 1. Changes in mean Global Acne Grading System (GAGS) scores across the 12-week treatment course in both study groups. The Long-Pulsed Neodymium (1064-nm) Laser group exhibited a faster and more substantial decline in acne severity compared with, Standard Medical Therapy statistically significant differences already visible by week 6 and more pronounced by week 12 (p = 0.007). Error bars indicate standard deviation

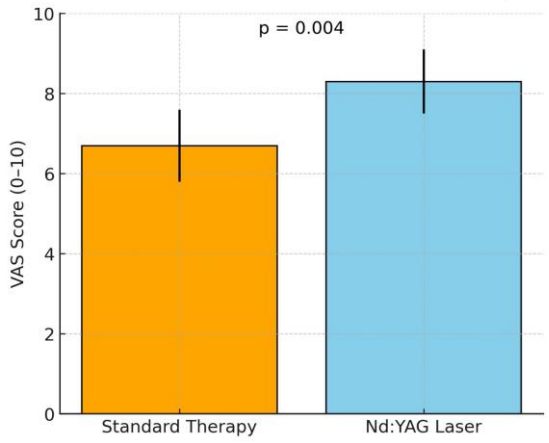

Figure 2. Visual Analogue Scale (VAS) assessment of patient satisfaction at week 12. The bar chart demonstrates that individuals treated with the Long-Pulsed Neodymium (1064-nm) Laser reported noticeably higher satisfaction compared with those receiving Standard Medical Therapy (p = 0.004). Higher VAS values indicate a better subjective treatment experience

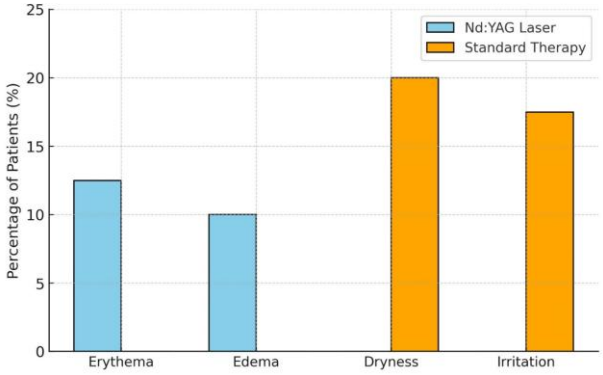

Figure 3. Comparison of adverse event profiles between the two treatment groups. The Long-pulse neodymium-based laser (1064 nm) group exhibited only mild and short-lasting reactions, predominantly transient erythema (12.5%) and slight edema (10%), both resolving spontaneously within 24–48 hours. In contrast, the Standard Medical Therapy cohort reported more persistent yet manageable effects, most commonly dryness (20%) and irritation (17.5%). No hyperpigmentation, hypopigmentation, or scarring occurred in either group, confirming the overall favorable safety of both treatment approaches

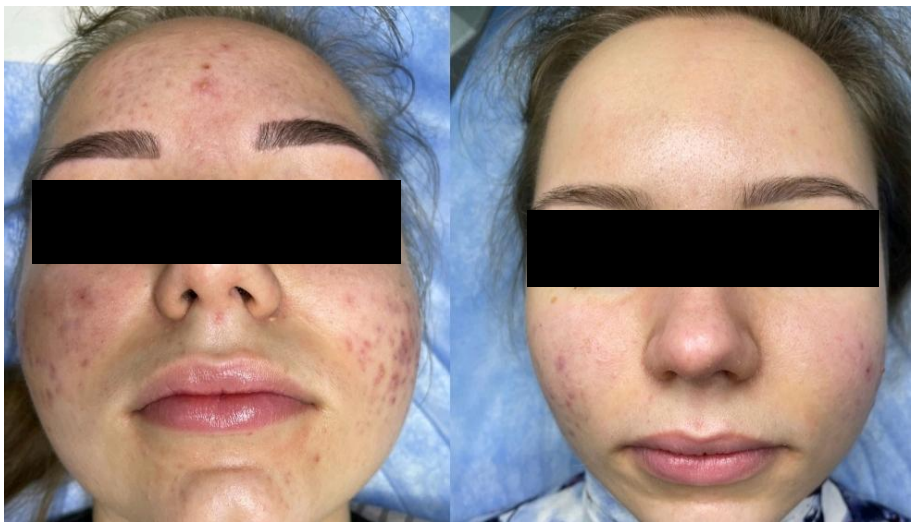

Figure 4. Patient from the 2nd group before and after a 12-weeks course of Nd:YAG laser therapy. The images demonstrate a marked reduction in inflammatory lesions and overall improvement in skin texture. Eyes are covered to ensure patient confidentiality

Figure 5. Patient from the 1st group before and after a 12-weeks course of the standard topical therapy with benzoyl peroxide, adapalene, and doxycycline: moderate improvement in inflammatory lesions. Eyes are covered to ensure patient confidentiality

DISCUSSION

The findings of this randomized trial offer robust comparative data on how long-pulsed 1064-nm neodymium-based laser therapy performs relative to guideline-directed topical–systemic pharmacologic treatment in patients with moderate acne vulgaris. Over the 12-week treatment course, both therapeutic strategies produced significant reductions in acne severity, as reflected by improvements in GAGS scores (Table 1, Figure 1). However, individuals receiving energy-based therapy experienced a faster and more pronounced decline in inflammatory lesions, with statistically significant between-group differences emerging by week 6 and becoming more substantial by week 12. Likewise, patient-reported satisfaction at week 12 favored the laser-treated cohort, which displayed higher VAS scores and fewer persistent treatment-related complaints (Table 2, Figure 2). These findings are consistent with published data indicating that long-pulse 1064-nm Nd:YAG technology is an effective and well-tolerated modality for suppressing inflammatory acne activity [12-14]. Prior investigations have further

suggested that incorporating laser techniques into acne regimens may enhance treatment response when added to conventional topical therapy, supporting a complementary role within multimodal management strategies [15]. The mechanisms responsible for the observed benefits of neodymium-based 1064-nm systems are well characterized. This wavelength enables deep dermal penetration, facilitating selective photothermal interactions with sebaceous glands while simultaneously reducing Cutibacterium acnes colonization. The thermal impact on sebaceous activity and local inflammation addresses several core contributors to acne pathogenesis. These direct tissue-level effects likely explain the faster clinical improvement recorded in the laser group, whereas pharmacologic therapies require more extended treatment intervals and stricter adherence to achieve comparable outcomes. Patient satisfaction is an essential element of acne management because it reflects not only clinical improvement but also the subjective perception of therapeutic success. The consistently higher VAS ratings in the laser-treated group underscore the importance of rapid visible changes in promoting patient confidence and adherence. These observations correlate with reports indicating that many individuals prefer non-pharmacologic or device-based options due to their convenience, minimal systemic risks, and aesthetic benefits [16–18]. Regarding safety, neither group experienced severe adverse reactions. In the neodymium-laser cohort, transient erythema and slight edema were the most frequent findings, resolving spontaneously within 24–48 hours (Table 3, Figure 3). Crucially, no pigmentary alterations or scarring occurred. Participants receiving standard therapy reported more persistent cutaneous irritation—primarily dryness and erythema—although these effects were mild and easily controlled (Table 4). The overall tolerability profile observed in this trial suggests that energy-based approaches may be particularly beneficial for patients who develop irritation from topical medications or for those who wish to minimize antibiotic exposure [19, 20]. Clinical photographs further confirmed these outcomes. As illustrated in Figure 4, the neodymium-based laser group demonstrated marked improvements by week 12, whereas Figure 5 shows the more gradual, yet still positive, changes obtained with conventional therapy. All images were obtained with informed consent to ensure ethical use and maintain patient confidentiality. Several important clinical implications emerge from these findings. First, long-pulse 1064-nm laser treatment represents a practical and effective alternative—or adjunct—to standard topical regimens in cases of moderate acne vulgaris. This is especially relevant given rising concerns over antibiotic resistance and the limitations of prolonged systemic therapy. Second, device-based approaches may be particularly suited for patients seeking faster cosmetic improvement or those who struggle with daily application of topical agents [21–23]. Despite the strengths of the study, certain limitations must be recognized. The sample size was relatively modest (80 participants) and derived from a single clinical center, potentially limiting generalizability. Additionally, the 12-week observation period did not allow evaluation of long-term remission or relapse. Future investigations should incorporate larger multicenter cohorts and extended follow-up intervals to assess durability of response and recurrence dynamics. Comparative studies evaluating other wavelengths, combination protocols, and multimodal energy-based strategies would also be valuable for refining therapeutic algorithms. Even with these limitations, the present study contributes meaningful evidence to the expanding literature on neodymium-based 1064-nm laser technology in acne therapy. By providing a direct comparison with standard topical treatment, this investigation enhances clinicians' understanding of its relative efficacy, safety, and patient-centered advantages. In summary, long-pulse 1064-nm Nd:YAG laser therapy demonstrated superior clinical outcomes, greater patient satisfaction, and fewer persistent adverse effects than conventional topical pharmacologic regimens in individuals with moderate acne vulgaris. Collectively, these findings support integrating this laser modality into contemporary acne management frameworks as a safe, effective, and minimally invasive therapeutic option.

CONCLUSION

In this study, long-pulsed 1064-nm Nd:YAG laser therapy demonstrated superior therapeutic outcomes compared with Standard Medical Therapy in patients with moderate acne vulgaris. Over the 12-week evaluation period, individuals receiving laser-based treatment experienced a more rapid and more substantial reduction in GAGS scores, alongside higher satisfaction levels reflected in VAS ratings. The frequency and duration of adverse effects were also lower in the laser group, underscoring its favorable tolerability profile. Taken together, these findings support the use of long-pulsed 1064-nm Nd:YAG laser therapy as a safe, minimally invasive, and clinically effective option for managing moderate acne. Larger multicenter studies with longer follow-up intervals are warranted to confirm the durability of clinical outcomes and further define the role of this modality within contemporary acne-treatment algorithms.

AUTHOR CONTRIBUTIONS

Belal A. S. Qoqazy- A, B, C, D
Oksana K. Melekhovets - A, B, C.

FUNDING

This study received no external financial support and was implemented within the framework of the research project “Study of comorbidities of non-communicable diseases to ensure a healthy lifestyle and promote the well-being of the population of different age groups” (state registration No. 0121U114163; project period 01.22–11.26).

CONFLICT OF INTEREST

The authors state that they have no competing interests of any kind – financial, professional, or personal – that could have affected the design, execution, interpretation, or publication of this study.

REFERENCES

1. Sudha M. A clinico-epidemiological study of acne vulgaris conducted at a tertiary care hospital, Tamil Nadu. MedPulse Int J Med. 2021;19(3):131–135. https://doi.org/10.26611/102119311
2. Tunca M, Balik ZB, Uncu HB, Botsali A. Stigmatization and psychosocial burden in acne patients. J Cosmet Dermatol. 2024. https://doi.org/10.1111/jocd.16678
3. Xu W, Xu J, Huang D, et al. Acne vulgaris: advances in pathogenesis and prevention strategies. Eur J Clin Microbiol Infect Dis. 2025;44:515–532. https://doi.org/10.1007/s10096-024-04984-8
4. Del Rosso JQ, Kircik L. The primary role of sebum in the pathophysiology of acne vulgaris and its therapeutic relevance in acne management. J Dermatolog Treat. 2023;34:2296855. https://doi.org/10.1080/09546634.2023.2296855
5. Reynolds RV, Yeung H, Cheng CE, Cook-Bolden F, Desai SR, Druby KM, et al. 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. Layton AM, Gupta G, Seukeran D, et al. What’s new after NICE acne guidelines. Dermatol Ther. 2024;14:2727–2738. https://doi.org/10.1007/s13555-024-01275-0
7. Li MK, Liu C, Hsu JTS. The use of lasers and light devices in acne management: an update. Am J Clin Dermatol. 2021;22:785–800. https://doi.org/10.1007/s40257-021-00624-5
8. Jean-Pierre P, Tordjman L, Ghodasara A, et al. Emerging lasers and light-based therapies in the management of acne: a review. Lasers Med Sci. 2024;39:245. https://doi.org/10.1007/s10103-024-04196-8
9. Dhaher SA, Yosif AM. Efficacy and safety of 1064-nm long-pulsed neodymium-doped yttrium garnet (Nd:YAG) laser for treating acne vulgaris: a prospective clinical trial. Iran J Dermatol. 2022;25(1):1–7. https://doi.org/10.22034/IJD.2021.286989.1371
10. Al Timimi Z, Al-Rubaye AF, Diwan DM. Laser use in dermatology: safety, innovations, and effectiveness. Ir J Med Sci. 2025;194:923–932. https://doi.org/10.1007/s11845-025-03942-3
11. Bhatt J, Kumar VJ, Chahat. Acne vulgaris: key insights, treatment, and future prospects. Mol Divers. 2025. https://doi.org/10.1007/s11030-025-11209-3
12. Nast A, Dréno B, Bettoli V, Bukvic Mokos Z, Degitz K, Dressler C, et al. European S3 guideline for acne treatment (2016 update). J Eur Acad Dermatol Venereol. 2016;30(8):1261–1268. https://doi.org/10.1111/jdv.13776
13. Pour Mohammad A, Seirafianpour F, Jafarzadeh A, et al. Systematic review of modern procedural therapies for acne vulgaris. Lasers Med Sci. 2025;40:383. https://doi.org/10.1007/s10103-025-04640-3
14. Gold MH, Goldberg DJ, Nestor MS. Current treatments of acne: medications, lights, lasers, and a novel 650-µs 1064-nm Nd:YAG laser. J Cosmet Dermatol. 2017;16(1):e17–e23. https://doi.org/10.1111/jocd.12367
15. Boonpethkaew S, Ratanapokasatit Y, Chirasuthat S, et al. Efficacy and safety of the 589/1319-nm solid-state dual-wavelength laser combined with topical benzoyl peroxide for inflammatory acne vulgaris: a split-face randomized controlled trial. Arch Dermatol Res. 2025;317:635. https://doi.org/10.1007/s00403-025-04146-6
16. Xu J, Huang S, Fu Z, Zheng W, Luo W, Zhuang N, et al. Light and laser therapies for sebaceous gland microecosystem in acne. Photodermatol Photoimmunol Photomed. 2025. https://doi.org/10.1111/phpp.70005
17. Chalermsuwiwattanakan N, Rojhirunsakool S, Kamanamool N, et al. Comparative efficacy of 1064-nm Nd:YAG vs 595-nm PDL for acne. J Cosmet Dermatol. 2021;20(7):2232–2239. https://doi.org/10.1111/jocd.13832
18. Cong TX, Hao D, Wen X, Li XH, He G, Jiang X. From pathogenesis of acne vulgaris to anti-acne agents. Arch Dermatol Res. 2019;311:337–349. https://doi.org/10.1007/s00403-019-01908-x
19. Hong JY, Seok J, Han HS, Park KY. Emerging innovations in acne management: a focus on non-pharmacological therapeutic devices. J Korean Med

Sci. 2025;40(9):e118. https://doi.org/10.3346/jkms.2025.40.e118
20. Jaiswal S, Jawade S, Madke B, Gupta S. Recent trends in acne management: review of the last decade. Cureus. 2024;16(3):e56596. https://doi.org/10.7759/cureus.56596
21. Barbieri JS, Spaccarelli N, Margolis DJ, James WD. Strategies to reduce systemic antibiotic use in acne. J Am Acad Dermatol. 2019;80(2):538–549. https://doi.org/10.1016/j.jaad.2018.09.055
22. Ishii L, Deoghare S, Boen M. Light and laser-based therapy in treatment of acne vulgaris: a clinical review. J Am Acad Dermatol. 2025;93(4):1058–1064. https://doi.org/10.1016/j.jaad.2025.06.046
23. Kesty K, Goldberg DJ. 650-µsec 1064-nm Nd:YAG laser treatment of acne: a double-blind randomized controlled study. J Cosmet Dermatol. 2020;19(7):1684–1690. **https://doi.org/10.1111/jocd.13480**

Received 08.01.2025 ***Accepted 29.05.2025***

INFORMATION ABOUT THE AUTHORS

Belal Awwad Salim Qoqazy

Postgraduate Student in Dermatovenereology, Department of Internal and Family Medicine, Sumy State University, Ukraine

Oksana K. Melekhovets

PhD in Medical Sciences, Professor, Professor of the Department of Internal and Family Medicine, Sumy State University, Sumy, Ukraine