

EFFICACY OF TOPICAL METRONIDAZOLE GEL IN DEMODEX-ASSOCIATED ACNE AMONG HIGH SCHOOL STUDENTS IN VIETNAM

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ABSTRACT

Background: Demodex-associated acne is a chronic dermatological condition in which treatment often requires adjunctive therapy with metronidazole. Topical metronidazole gel has shown potential efficacy; therefore, further evaluation of its role is necessary to optimize management outcomes. **Objectives:** To evaluate the clinical outcomes of topical metronidazole gel in patients with Demodex-associated acne. **Materials and methods:** A cross-sectional descriptive study with analytical components was conducted among 34 high school students with Demodex-associated acne in Ben Tre City, Vietnam. All patients received topical metronidazole gel, and treatment outcomes were assessed at 2 and 4 weeks. **Results:** The mean age of the participants was 16 years, with an equal male-to-female ratio. After 2 weeks of treatment, Demodex density decreased from 1.82 ± 0.39 to 1.71 ± 0.68 ($p < 0.05$). Clinically, 50.0% of patients achieved a good response at 2 weeks, which increased to 82.4% at 4 weeks. A moderate response was observed in 14.7% at 2 weeks but was absent at 4 weeks. **Conclusion:** Topical metronidazole gel demonstrated significant efficacy in reducing Demodex density and improving clinical outcomes in acne patients. These findings highlight its role as an effective therapeutic option for Demodex-associated acne.

Keywords: Acne vulgaris, Demodex, metronidazole, topical therapy, treatment outcome.

I. INTRODUCTION

Acne is a common dermatological condition among adolescents, with a prevalence of approximately 81.8% [1], [2], [3]. In clinical practice, cases of adult acne that do not respond to conventional therapies are often associated with pathogenic microorganisms such as *Demodex* [4], [5]. Currently, *Demodex* is recognized as a contributing factor in the pathogenesis of several dermatological disorders, including rosacea and perioral dermatitis [6], [7]. However, the relationship between *Demodex* infestation and acne remains poorly understood and continues to attract considerable scientific interest [8]. In addition, the management of acne with concurrent *Demodex* infestation has become an important clinical concern. Oral metronidazole, an imidazole derivative, interferes with the reproductive cycle of *Demodex* while also exerting anti-inflammatory effects and inhibiting neutrophil migration [9]. Evidence from previous studies has further demonstrated that treatment regimens incorporating metronidazole can improve *Demodex*-associated skin inflammation. Therefore, this study aimed to evaluate the treatment outcomes of acne patients with *Demodex* infestation treated with topical metronidazole gel.

II. MATERIALS AND METHODS

2.1. Participants

The study included high school students in Ben Tre City, Ben Tre Province, who

were clinically diagnosed with acne and *Demodex* infestation.

- **Eligible participants:** Students aged 16–18 years (grades 10–12) who were currently enrolled in local high schools. Approval and support were obtained from school administrators and homeroom teachers, and written informed consent was obtained from all participants.

- **Exclusion criteria:** Participants with psychiatric disorders (e.g., anxiety, depression, or severe stress) or cognitive impairment that could interfere with their ability to complete questionnaires, as well as those who were absent at follow-up evaluations.

2.2. Methods

- **Study design and sample size:** This was an interventional study with a descriptive and analytical design. A total of 34 patients who met the eligibility criteria were enrolled using total population sampling.

- **Treatment regimen and study procedures:** Participants received topical metronidazole 1% gel (15 g per tube, containing 0.15 g of active ingredient). A thin layer of the gel was applied once daily to cleansed acne lesions for 8–12 weeks. Clinical symptoms and the presence of *Demodex* mites (confirmed by direct microscopic examination of skin scrapings from lesion scales; positivity defined as ≥ 5 *Demodex* per high-power field and negativity defined as < 5 *Demodex* per high-power field) were assessed at 2 and 4 weeks of treatment.

- **Data collection:** Data were collected using structured questionnaires and direct clinical examination. Laboratory confirmation of *Demodex* infestation was performed by light microscopy of skin scrapings.

- **Ethical approval:** The study protocol was approved by the Institutional Review Board for Biomedical Research of Can Tho University of Medicine and Pharmacy (Approval No. 24.077/PCT-HDD, June 28, 2024). All participants provided informed consent. The study ensured that no physical or psychological harm, inconvenience, or financial burden was imposed on the participants or their families.

III. RESULTS

3.1. General characteristics of the study population

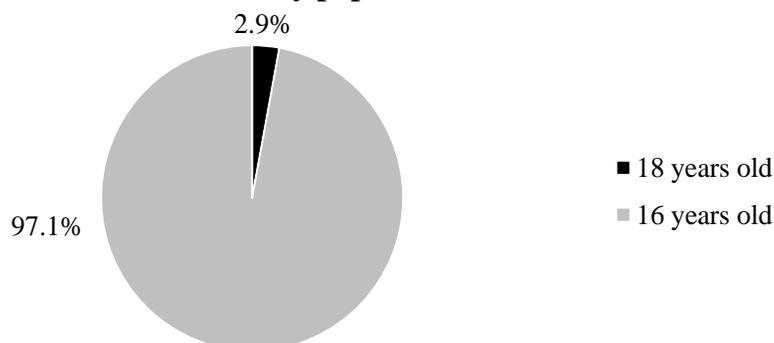


Figure 1. Age distribution of acne patients infected with *Demodex*

Among the study population, the 16-year-old group accounted for the majority (97.1%), while the 18-year-old group represented the lowest proportion (2.9%).

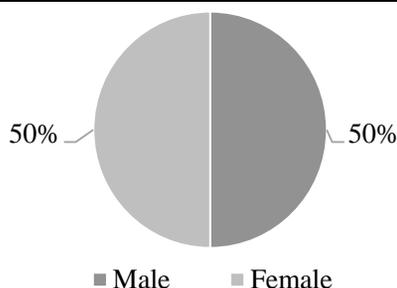


Figure 2. Gender distribution of acne patients infected with Demodex
The study population showed an equal distribution between males and females.

3.2. Treatment outcomes of acne patients with Demodex infestation using topical metronidazole gel

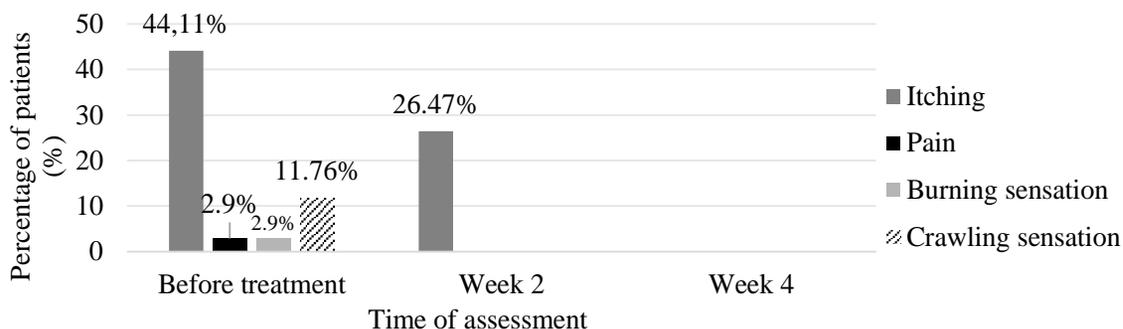


Figure 3. Improvement of subjective symptoms after two and four weeks of treatment

After two weeks of treatment, the proportion of patients with itching decreased from 44.11% to 26.47%, while other symptoms such as pain, burning sensation, and crawling sensation had almost completely resolved. After four weeks of treatment, all clinical symptoms had disappeared.

Table 1. Clinical symptom improvement following treatment

| Clinical outcome | After 2 weeks (n, %) | After 4 weeks (n, %) |
|------------------|----------------------|----------------------|
| Good | 17 (50.0) | 28 (82.4) |
| Fair | 12 (35.3) | 6 (17.6) |
| Moderate | 5 (14.7) | 0 (0.0) |
| Poor | 0 (0.0) | 0 (0.0) |
| Total | 34 (100) | 34 (100) |

After two weeks of treatment, the highest proportion of patients showed a good response (50%), followed by fair response (35.3%) and moderate response (14.7%), with no poor response observed. After four weeks, all patients exhibited either good or fair responses, with good response accounting for the majority (82.4%).

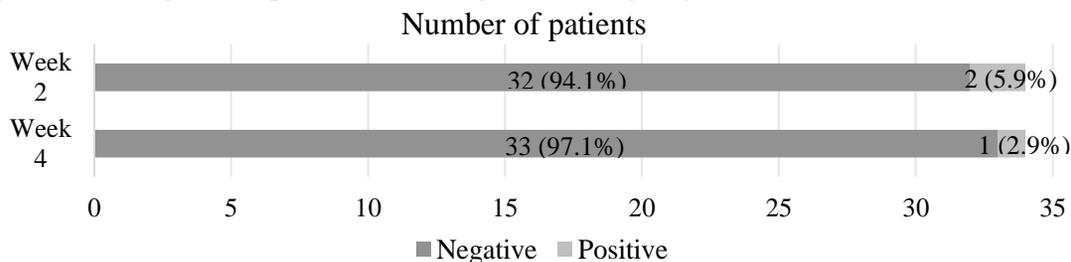


Figure 4. Results of Demodex examination after treatment

After two weeks of treatment, 94.1% of patients had negative results, while 5.9% remained positive. At week 4, the proportion of negative results increased to 97.1%, with only 2.9% still positive.

Table 2. Demodex density before and after treatment

| Time point | Mean ± SD | Mean difference | <i>p</i> value |
|------------------|-------------|-----------------|----------------|
| Before treatment | 1.82 ± 0.39 | | |
| After 2 weeks | 1.71 ± 0.68 | -0.11 | < 0.001 |
| After 4 weeks | 1.79 ± 0.48 | -0.03 | < 0.001 |

Values are presented as mean ± standard deviation (SD). *p* < 0.05 indicates statistical significance.

After two weeks of treatment, the Demodex density decreased from 1.82 ± 0.39 to 1.71 ± 0.68, with a mean difference of -0.11 (*p* < 0.001), indicating that indicating a statistically significant reduction in Demodex density. After four weeks, the density slightly increased to 1.79 ± 0.48, but the overall difference compared with baseline remained statistically significant (*p* < 0.001).

IV. DISCUSSION

In our study, the prevalence of acne associated with *Demodex* infestation was concentrated in the 16-year-old group, with a male-to-female ratio of 1:1. This age distribution is consistent with recent studies reporting a high prevalence of Demodex infestation among adolescents and young adults with acne vulgaris [8], [10].

According to the results presented in Figure 3, after 2 weeks of treatment, the proportion of patients reporting pruritus decreased from 44.11% to 26.47%, and other symptoms such as pain, burning, and crawling sensations were no longer observed after 2 and 4 weeks of treatment. Nguyen (2023) reported that pruritus persisted in 33.33% of patients after 2 weeks and 25.49% after 4 weeks, which were higher than in our study [11]. This difference may be explained by the route of administration: Nguyen used systemic metronidazole, whereas our study employed topical metronidazole [11]. Topical administration allows the drug to act directly at the site of Demodex infestation, leading to faster parasite eradication and inflammation reduction, thereby alleviating pruritus more rapidly. In contrast, oral metronidazole requires systemic absorption and tissue distribution, which may result in a slower onset of action and lower effective drug concentrations in the skin [9].

Our findings also showed that after 2 weeks of treatment, 50% of patients demonstrated a good response and 35.3% showed a fair response. After 4 weeks, the proportion of good responders increased to 82.4%, with 17.6% showing a fair response. Similarly, improvements have been reported in recent studies evaluating topical metronidazole in *Demodex*-associated acne and other facial dermatoses [5], [10]. After 4 weeks, only 1 of 34 patients (2.9%) remained positive for *Demodex*. Nguyen (2023) reported a negative skin scraping rate of 78.43% after 2 weeks, which increased progressively to 86.27%, 90.2%, and 94.12% at subsequent 4-week intervals [11]. In comparison, our study demonstrated a higher negative rate at the 2-week time point. This difference may be attributed to the treatment regimen: our study utilized topical metronidazole gel, whereas Nguyen (2023) combined oral isotretinoin with systemic metronidazole [11]. Topical metronidazole provides direct action on the skin lesions, leading to more rapid reduction of mite counts. Furthermore, our study population

consisted of high school students, who may differ in skin characteristics and acne severity compared to the population in Nguyen's study [11]. Differences in age, skin type, and acne severity may all influence treatment outcomes. Additionally, the use of topical metronidazole gel may be more convenient and associated with fewer adverse effects than systemic therapies, which could contribute to better treatment adherence and higher rates of negative Demodex results in our cohort.

V. CONCLUSION

Topical metronidazole gel demonstrated significant efficacy in reducing *Demodex* infestation and improving acne-related symptoms among high school students. The treatment was well tolerated, convenient, and associated with rapid symptomatic relief.

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