Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/24aadr63

EVALUATING THE IMPACT OF DOXYCYCLINE GEL WITH ZINC OXIDE FOR TREATMENT OF MODERATE ACNE VULGARIS: A RANDOMIZED CONTROLLED TRIAL

Amnah Sarwar[1], Fareeda Islam[2], Baber Khan[3], Rija hussain buriro[4], Nadia Naeem[5], Razia Mushtaq[6], Perah Khadim[7], Talia Hasam[8], Sonia khan[9]*, Nabiha Fatima[10], Misha Fatima[11]

[1]Consultant Dermatologist , Sindh Government hospital Memon goth, Karachi, Pakistan
[2]Professor, Dept of Pharmacology, Karachi Medical &Dental College KMC, Karachi, Pakistan
[3]Director, Inland Revenue Audit, Pakistan
[4]Fourth year student, United college of physical therapy, Karachi, Pakistan
[5]Assistant Professor, Dept of Pharmacology, Jinnah Sindh Medical University Karachi
[6]Consultant Dermatologist , Dar al shifa medical centre , Bahrain
[7]Research Officer, Indus Hospital and Health Network, Karachi, Pakistan
[8]Lecturer, Department of Pharmacology, Al-Tibri Medical College, Karachi, Pakistan
[9] *Associate Professor, Dept of Pharmacology, Al-Tibri Medical College, Karachi, Pakistan
[10]Third Year student, Doctor of Pharmacy , University of Karachi, karachi, Pakistan
[11]First Year, Pre –Medical student, karachi, Pakistan

***Corresponding Author:** Sonia Khan
*Email: drsonia.azeem2@gmail.com

ABSTRACT

Background Acne vulgaris, commonly known as acne, is a chronic skin condition characterized by the occurrence of comedones , papules, pustules and sometimes cysts with nodules. It primarily affects adolescents and young adults, but can persist into adulthood.

Objective: To evaluate the efficacy of doxycycline gel versus zinc oxide in the treatment of moderate acne vulgaris at tertiary care Hospital, Karachi.

Study design: Randomized controlled trial.

Place and duration of study: This study was conducted at Department of Dermatology, Dow university hospital, Karachi from November 2023 till February 2024.

Methodology: Data was prospectively collected from patients after taking consent. The sample size for the study was 100 patients, 50 in each group (A- doxycycline gel and B- zinc oxide gel) were included. Patients presenting with moderate acne vulgaris in either group were assessed for degree of improvement using Global Acne Grading Scale and patients achieving a score of ≤ 18 after 12 weeks of treatment was labeled as efficacy. Data was analyzed on SPSS Version 22.

Results: The study involved participants aged 20-70 years with Group A (mean age 24.20±5.99) and Group B (mean age 26.221±6.50). In both groups, predominantly there were females, majority in the 20- 49 age range. Efficacy was significantly higher in Group B (82%) compared to Group A (12%). Stratification by gender, and age revealed substantial differences in efficacy, particularly for participants with acne duration ≤ 3 months.

Conclusion: The outcome of this study demonstrates that zinc oxide gel had better efficacious results compared to the doxycycline gel monotherapy after 12 weeks of treatment.

Keywords: Acne Vulgaris, doxycycline gel, zinc oxide gel, Topical Therapy, Randomized trial

INTRODUCTION:

Acne vulgaris (AV) is a widespread skin condition that affects the pilosebaceous unit, manifesting as both non inflammatory and inflammatory lesions characterized by comedones, papules, pustules and nodules which can lead to varying degrees of scarring[1]. Typically emerging during adolescence, it has a lifetime prevalence of around 85%. The condition's pathogenesis involves a complex interplay of factors, including abnormal follicular keratinization, androgen-driven sebum production, colonization by Propionibacterium acnes and intricate inflammatory processes that involve both innate and adaptive immunity. This multifaceted process ultimately contributes to the development of acne lesions and associated scarring[2,3]. The multifactorial nature of acne pathogenesis involves an interplay of sebum production, follicular hyperkeratinization, bacterial colonization and inflammation. Understanding these underlying mechanisms has enabled the development of targeted therapies that address specific aspects of acne development. By inhibiting sebum production, reducing bacterial loads or minimizing inflammation, these treatments aim to mitigate the severity of acne and prevent long-term scarring[4]. As research continues to uncover the complexities of acne pathogenesis, new therapeutic targets are being identified, paving the way for innovative treatments that can provide improved outcomes for individuals affected by this common skin condition[5,6].

Doxycycline gel is a widely used antibiotic that exhibits potent anti-acne properties. By inhibiting the growth of Propionibacterium acne, a bacteria linked to acne development, doxycycline reduces acne lesions and inflammation. Additionally, its anti-inflammatory effects help mitigate the severity of acne[7]. It is often prescribed for moderate to severe acne cases, offering a valuable treatment option for individuals affected by this common skin condition. However, the extensive use of antibiotics for acne has led to the emergence of antimicrobial resistance, including resistance in Propionibacterium acnes, highlighting the need for alternative and complementary treatments i.e, Zinc oxide etc [8,9].

Zinc oxide gel has dual antibacterial and anti-inflammatory properties make it an effective treatment for reducing acne. The dual properties of zinc make it a valuable component in acne management, potentially helping to reduce lesion counts, inflammation and bacterial colonization. Current guidelines emphasize avoiding prolonged monotherapy for chronic conditions like acne, which can lead to resistance and reduced efficacy[10,11]. Recent advancements in understanding acne's pathogenesis have led to emerging treatment modalities. A study found that Zinc oxide gel tends to be effective in 53.19% of cases, with 50% of patients achieving complete clearance after 12 weeks, compared to 50% efficacy with doxycycline.

The study highlighted the efficacy and safety of topical zinc oxide gel versus doxycycline gel in the treatment of acne vulgaris. The study aims to evaluate the effectiveness of these two treatments in reducing acne lesions, inflammation and improving overall skin appearance. Additionally, the study seeks to assess the tolerability and safety profile of both treatments, with a focus on minimizing adverse effects and optimizing patient outcomes. By comparing these two treatments, the study aims to provide valuable insights into the most effective topical therapy for acne vulgaris, ultimately informing clinical decision-making and improving patient care.

METHODOLOGY

A randomized control trial included 100 patients, aged 20-70 years, of both genders, presenting to the Department of Dermatology, Dow university hospital, Karachi with acne vulgaris were included. Using the Global Acne Grading Scale, we assessed lesion severity, grading comedones, papules, pustules and nodules. Patients with a global score of 19-30 were included. After 12 weeks of treatment, we evaluated the degree of improvement using the same scale, defining efficacy as a score of ≤ 18. This assessment allowed us to compare treatment outcomes in patients with moderate acne vulgaris.

The study excluded patients with a history of systemic treatments, unrealistic expectations, disease duration over 3 months, secondary skin infections, pregnancy, lactation and severe hematological abnormalities. After obtaining institutional ethical review committee approval, patients provided written informed consent and demographic information. Patients were randomly allocated to either Group A (doxycycline gel) or Group B (Zinc oxide gel). Doxycycline and Zinc oxide gel was applied once daily for 12 weeks.

Ethical considerations

The study was approved by the institutional IRB of Dow University of Health Sciences.

STATISTICAL ANALYSIS

Data analysis using SPSS Version 22 included calculating means, standard deviations, frequencies and percentages. Chi-square tests compared treatment efficacy between groups, with effect modifiers controlled through stratification. A p-value of ≤ 0.05 was considered significant.

RESULTS

The demographic analysis of the study population revealed an age range of 20-70 years, with a mean age of 24.20±5.99 years in Group A (doxycycline gel) and 26.22±6.50 years in Group B (Zinc oxide). Notably, the majority of patients in both groups fell within the 20-49 years age range, indicating that acne vulgaris predominantly affects young to middle-aged adults.

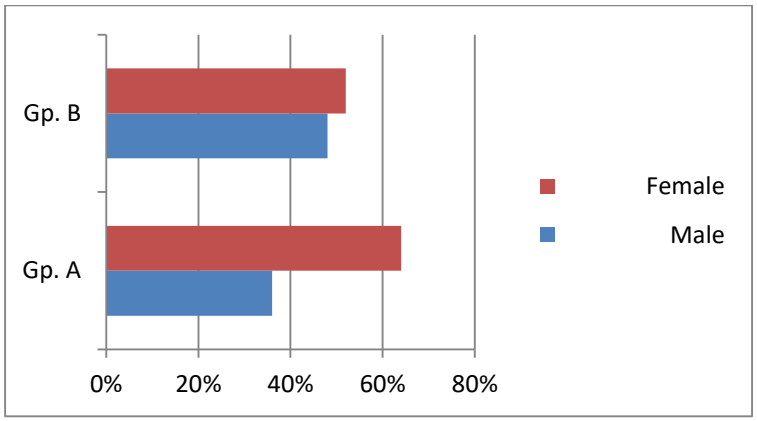

Fig 1: Gender distribution of two groups of the study participant

Furthermore, the study showed a female predominance in both groups, suggesting that females are more likely to seek treatment for acne vulgaris. The efficacy analysis yielded striking results, with a significant difference between the two treatment groups. Group B (Zinc oxide gel) demonstrated a substantially higher efficacy rate of 82%, compared to 12% in Group A (doxycycline gel). This notable difference highlights the potential superiority of Zinc oxide gel in treating acne vulgaris.

Table-1 Clinical Characteristics Of The Two Groups

Clinical Variables	Efficacy Group A n = 50	Efficacy Group B n= 50
Age (years)	24.20 ± 5.99	26.22 ± 6.50
Age **50-70 Years** **20-49 Years**	21 (42%) 29 (58%)	21 (42%) 29 (58%)
Duration of Acne Vulgaris **≤ 3 Months** **> 3 Months**	24 (48%) 26 (52%)	20 (40%) 30 (60%)

To control for potential confounding factors, stratification analysis was performed based on gender, age and duration of acne vulgaris. The gender-specific efficacy analysis revealed statistically significant p-values of 0.001 for both males and females, indicating that the treatment efficacy was not influenced by gender.

Table-2 Stratification For Efficay of participants in the study

Clinical Variables	Efficacy Group A n = 50		Efficacy Group B n= 50		P values
	Yes (6)	**No (44)**	**Yes (41)**	**No (9)**	
50-70 Years	02 (9.5%)	19 (90.5%)	17 (81%)	04 (19%)	**0.001**
20-49 Years	04 (13.8%)	25 (86.2%)	24 (82.8%)	05 (17.2%)	**0.001**
Male	02 (11.1%)	16 (88.9%)	17 (70.8%)	07 (29.2%)	**0.001**
Female	04 (12.5%)	28 (87.5%)	24 (92.3%)	02 (7.7%)	**0.001**
≤ 3 Months	04 (16.7%)	20 (83.3%)	18 (90%)	02 (10%)	**0.001**
> 3 Months	**02 (7.7%)**	**24(92.3%)**	**23 (76.7%)**	**07(23.3%)**	**0.001**

Similarly, when stratified by duration of acne vulgaris (≤ 3 months), the efficacy rates varied significantly between the two groups, with 16.7% in Group A and 90% in Group B achieving desired outcomes (p-value 0.001). These findings suggest that Zinc oxide gel is more effective than doxycycline gel in treating acne vulgaris, particularly in patients with shorter disease duration.

DISCUSSION

Acne vulgaris, a prevalent skin condition among adolescents has a profound impact on an individual's quality of life, extending beyond physical symptoms to affect self-esteem, psychosocial development, and overall well-being[12,13]. Over the past two decades, significant advancements have been made in understanding the underlying causes of acne, driving the development of innovative therapeutic approaches[14]. These novel treatments target specific factors that contribute to acne pathogenesis, offering improved management options for this common condition. By addressing the complex interplay of factors involved in acne development, these medications aim to provide more effective and targeted therapy, ultimately enhancing treatment outcomes and patient quality of life [15,16].

Zinc oxide boasts a unique dual-action profile, combining potent anti-inflammatory and antimicrobial properties. Given its dual therapeutic effects, it merges as an attractive option for physicians seeking to address acne effectively. By leveraging its multifaceted mechanism of action, clinicians can target both the bacterial and inflammatory components of acne pathogenesis, potentially leading to improved treatment outcomes[17]. In this way, zinc oxide gel offer a promising solution for patients seeking effective, well-tolerated and convenient acne therapy [18.19]. Furthermore, zinc's immune-boosting properties can help prevent infections and support overall skin health.

A comparative analysis of both the mentioned treatment of acne vulgaris revealed striking differences in efficacy. Specifically, a mere 12% of patients treated with doxycycline experienced significant improvement, whereas a substantial 82% of patients receiving zinc oxide demonstrated notable benefits[20-22]. This disparity in efficacy is consistent with prior research highlighting doxycycline established role in acne management. A key factor contributing to zinc oxide 's superior efficacy may be its dual mechanism of action, which combines potent anti-inflammatory and antimicrobial properties. In contrast, doxycycline primarily targets the bacterial component of acne pathogenesis[23]. By simultaneously addressing both the inflammatory and microbial aspects of acne, zinc oxide may offer a more comprehensive treatment approach, ultimately leading to improved patient outcomes[24].

These findings emphasize the importance of personalized acne treatment, taking into account individual patient characteristics and responses. The significant difference in efficacy between doxycycline and zinc oxide underscores the need for clinicians to carefully consider the mechanisms of action and patient profiles when choosing topical treatments. To further validate these results,

additional research with larger, more diverse populations, including various acne severities and demographics, is necessary to ensure the generalizability of these findings.

CONCLUSION:

Zinc oxide gel demonstrated superior efficacy and a favorable safety profile compared to doxycycline gel after 12 weeks. As an anti-inflammatory and antibacterial agent, zinc oxide proved effective in treating acne vulgaris with minimal side effects, making it a well-tolerated option for once-daily application. However, further studies are necessary to assess its long-term efficacy, safety and impact on quality of life, as well as to determine optimal treatment selection.

REFERENCES:

1. Tan AU, Schlosser BJ, Paller AS. A review of diagnosis and treatment of acne in adult female patients. Int J Womens Dermatol. 2017 Dec 23;4(2):56-71.
2. Adebamowo C.A., Spiegelman D., Danby F.W., Frazier A.L., Willett W.C., Holmes M.D. High school dietary dairy intake and teenage acne. J Am Acad Dermatol. 2019;52(2):207–14
3. Agarwal US, Besarwal RK, Bhola K. Doxycycline in different dose regimens for acne vulgaris: A randomized comparative trial. Indian J Dermatol Venereol Leprol. 2021;77(6):688– 94.
4. Akman A, Durusoy C, Senturk M, Koc CK, Soyturk D, Alpsoy E. Treatment of acne withzinc supplements: a randomized, controlled multicenter study. Arch Dermatol Res. 2017;299(10):467–73.
5. Zhu YI, Stiller MJ. Zinc oxide geland sulfones in dermatology: overview and update. J Am Acad Dermatol. 2021;45(3):420–434.
6. Ross CM. The treatment of acne vulgaris with zinc supplements. Br J Dermatol. 1961;73:367–70.
7. Czemielewski J, Michel S, Bouclier M, et al. Adapalene biochemistry and the evolution of a new topical retinoid for treatment of acne. J Eur Acad Dermatol Venereol. 2021;15(3):5–12.
8. Nast A, Dreno B, Bettoli V, et al. European evidence-based (s3) guidelines for the treatment of acne-update 2016 short version. J Eur Acad Dermatol Venereol. 2016;30(8):1261–68.
9. Lynde CW, Andriessen A. Cohort study on the treatment with zinc oxide gel of mild to moderate inflammatory acne of the face in women. Skinmed. 2024;12(1):15–21.
10. Taghetti E, Harper JC, Oefelein MG. The efficacy and tolerability of doxycycline gel in female Vs males patients with facial and vulgaris, gender as a clinically relevant outcome variable. J Drug Dermatol. 2022;11(12):1417–21.
11. Brar BK, Kumar S, Sethi N. Comparative evaluation of Isotretinion vs. doxycycline 1% gel in mild to moderate acne vulgaris. Gulf J Dermatol Venereol. 2017;23(1):34-9.
12. Adityan B, Kumari R, Thappa DM. Scoring systems in acne vulgaris. J Dermatol Venereol Leprol 2009;75:323.
13. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries :A systematic analysis for the global burden of disease study 2020. Lancet 2012;380:2163-96.
14. Tan AU, Schlosser BJ, Paller AS. A review of diagnosis and treatment of acne in adult female patients. Int J Womens Dermatol 2018;4:56-71.
15. Katsambas A, Towarky AA, Stratigos J. Topical doxycycline phosphate compared with oral doxycycline in the treatment of acne vulgaris. Br J Dermatol 1987;116:387-91.
16. Shalita AR, Smith EB, Bauer E. Topical erythromycin v doxycycline therapy for acne: A multicenter, double-blind comparison. Arch Dermatol 1984;120:351-5.
17. Chu A, Huber FJ, Plott RT. The comparative efficacy of doxycycline
18. and erythromycin 4%/zinc 1.2% solution in the treatment of acne vulgaris. Br J Dermatol 1997;136:235-8.
19. Drucker CR. Update on topical antibiotics in dermatology. Dermatol Ther 2012;25:6-11.
20. Worret WI, Fluhr JW. Topische Therapie mit Benzoylperoxid, Antibiotika und Azelainsäurebei

der Akne (Acne therapy with topical benzoyl peroxide, antibiotics and azelaic acid). J Dtsch Dermatol Ges 2006;4:293-300.
21. Patel M, Bowe WP, Heughebaert C, Shalita AR. The development of antimicrobial resistance due to the antibiotic treatment of acne vulgaris: A review. J Drugs Dermatol 2010;9:655-64.
22. Guin JD, Reynolds R, Gielerak PL. Penetration of topical doxycycline into comedones. J Am Acad Dermatol 1980;3:153-6.
23. Tan J. Zinc oxide gel: A new option in topical therapy for acne. Skin Ther Lett 2022;17:1-3.
24. Verma R, Yadav P, Chudhari M, Patel J, Umrigar D. Comparison of efficacy of two topical drug therapy of acne vulgaris–1% doxycycline with erythromycin: A split face comparative study. National Journal of Physiology, Pharmacy and Pharmacology. 2022;12(6):817-2