

Clinical Efficacy of Azithromycin Versus Doxycycline in Patients of Acne Vulgaris

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ABSTRACT

Objective: To determine the clinical efficacy of azithromycin versus doxycycline in patients of acne vulgaris. **Methodology:** A quasi-experimental study Was conducted at the Department of Dermatology, Dow University of Health Sciences (DUHS), Karachi, from 09-07-2025 to 10-10-2025. The patients diagnosed with acne vulgaris were randomly distributed into Group A (Azithromycin Group) and Group B (Doxycycline Group). Group A patients were treated with oral azithromycin in a dose of 500 mg once a day and three times a week, whereas patients in group B received oral doxycycline in a dose of 100 mg once a day. All patients were additionally given 0.1% topical adapalene. Follow-up of each patient was performed after 6 weeks and 12 weeks, and improvement was measured after 12 weeks of therapy.

Results: Of the 122 patients with acne vulgaris, males were 36.1% (n=22) and 31.1% (n=19), and females were 63.9% (n=39) and 68.9% (n=42) in the Azithromycin and Doxycycline groups, respectively. There was no discernible difference between the two groups' levels of severity before treatment (p-value=0.917) and after six weeks of treatment (p-value=0.994), while a significant difference is seen after twelve weeks of treatment (p-value=0.018). Improvement in terms of clinical efficacy was significantly (p-value=0.006) higher in the Doxycycline group than in the Azithromycin group.

Conclusion: The clinical efficacy of azithromycin and doxycycline was similar after six-weeks of treatment, while doxycycline showed significantly higher clinical efficacy than azithromycin after twelve weeks of treatment in the management of acne vulgaris.

Keywords: Acne vulgaris, adolescents, azithromycin, doxycycline

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INTRODUCTION

Acne vulgaris is currently the commonest dermatological problem internationally and nationally¹. It is a common, chronic inflammatory condition of the pilosebaceous unit (which includes the sebaceous gland and hair follicle). It is largely characterized by excessive sebum production, bacterial colonization, follicular hyperkeratinization, and inflammation. The disorder is distinguished by the chronic or recurrent formation of pustules, erythematous papules, and comedones².

It is a relatively common skin condition that mostly affects the face but can also affect the upper arms, back and trunk. It can manifest as inflammatory and non-inflammatory lesions³.

With an approximate global frequency of 9.79% (across all age groups), it is among the most prevalent skin conditions⁴. Acne prevalence varies significantly among nations and age groups; estimates range from 35% to almost 100% of adolescents experiencing acne at some time⁵. One of the most prevalent skin disorders, acne mostly affects people in their teenage years and early teens. In 2019, acne vulgaris caused 4.96 million DALYs worldwide including 3.52 million DALYs that belonged to those aged 15 to 49. Acne was the 27th leading cause of increasing DALYs in the 10–24 age group in 1990, and it rose to the 19th position in 2019^{6,7}. According to a recent report, 16.8% of university students in Pakistan have acne. Acne may pose a significant burden by significantly impacting the quality of life as well as moods of affected

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individuals, including an increased risk of anxiety, depression, and suicidal ideation⁵⁻⁸.

Acne vulgaris is normally thought of as a benign, self-limiting disorder; however, it can result in serious psychological issues as well as disfiguring scars. There are numerous formulations and therapeutic agents available, each of which targets a distinct aspect of the pathophysiology of acne. The severity of the condition, preference of the patient, and tolerance are taken into consideration while choosing a treatment^{9,10}. The guidelines for acne therapy states that some systemic and topical treatments are still considered standard. However, new therapy approaches are still required¹¹. Currently, oral antibiotics are widely used in managing acne vulgaris. Azithromycin is a macrolide antibiotic that binds to the 50S ribosomal subunit to prevent bacterial protein synthesis. It also has immunomodulatory properties that minimize inflammatory acne lesions. However, it may cause gastrointestinal problems and raise worries about antibiotic resistance. On the other hand, doxycycline is a tetracycline antibiotic that binds to the 30S ribosomal subunit to prevent bacterial protein synthesis. It also has anti-inflammatory properties that minimise inflammatory acne lesions. It may also cause gastrointestinal problems and photosensitivity, especially after prolonged treatment^{12,13}. Systemic antibiotics with topical agents have better safety profile and fewer side effects. Therefore, Azithromycin and Doxycycline are the systemic antibiotics of choice for managing acne in clinical practice across the world^{14,15}.

The prevalence and treatment of acne differ by gender, ethnicity, and age group in different nations. This is mostly because of environmental variables, social behaviours, and genetic reasons. As of right now, not much is known about the prevalence, distribution, and treatment of acne in Pakistan. Thus, there is a need to evaluate various treatment modalities and compare their efficacy in management of acne vulgaris. Therefore, this study has been designed at dermatology department of Dow University of Health Sciences (DUHS), Karachi in order to determine the clinical effectiveness of azithromycin as well as doxycycline in patients of acne vulgaris.

METHODOLOGY

IRB/ERC Approval: This study was conducted with approval from the Dow University of Health Sciences, Karachi, Institutional Review Board (IRB), through letter number 4050 dated 08-07-2025.

A quasi-experimental study on acne vulgaris patients was conducted at the dermatology department of Dow

University of Health Sciences (DUHS), Karachi, from 09-07-2025 to 10-10-2025. Sample size was calculated using Open EPI software available online. This software uses the proportion of a previous study by Arjel et al., which found a 42.5% improvement with Azithromycin and a 67.5% improvement with Doxycycline after 12 weeks of treatment¹⁵. By taking a two-sided significance level of 95% and a power of 80%, the sample size stands to be n = 122 (61 in each group).

The study included (1) diagnosed cases of acne vulgaris who had been suffering from acne vulgaris for the past three months, (2) patients aged 14 to 45 years, and (3) both male and female patients. The study excluded (1) pregnant or lactating mothers, (2) patients already on medications like isotretinoin, oral contraceptives, hormonal therapy or retinoids, (3) patients who refused to participate in the research, (4) patients with eczema and photosensitive disorders, and (5) patients with known hypersensitivity to Azithromycin or Doxycycline.

Outpatients visiting the Outpatient Department of Dermatology and meeting the inclusion criteria were recruited. Each patient's specific demographic information, including age, marital status, educational status, residence and job status, were obtained. Each acne patient was evaluated for the duration of acne, the location of acne, and for acne severity by using a simple acne grading system. Patients were included in a 12-week therapy plan and were randomly distributed (lottery method) into Group A and B. Group A patients were treated with oral azithromycin in a dose of 500 mg once a day and three times a week, whereas group B patients with oral doxycycline in a dose of 100 mg once a day. All patients were additionally given 0.1% topical adapalene. Follow-up of each patient was performed after 6 weeks and 12 weeks, and improvement was measured after 12 weeks of therapy. The Simple Acne Grading System was utilized for confirming the diagnosis and grade of acne vulgaris (Table 1). Clinical efficacy or improvement with treatment was evaluated at the end of treatment and confirmed by the presence of Grade zero (non-existence of the lesion). Safety of the drugs in acne vulgaris patients was confirmed by the presence of various side effects such as nausea, abdominal pain, diarrhoea, headache, photosensitivity, etc.

Table 1: Simple Acne Grading System

Grade	Explanation
Grade 0	Non-existence of the lesion
Grade I	Comedones, occasional papules
Grade II	Papules, comedones, few pustules
Grade III	Predominant pustules, nodules, abscesses
Grade IV	Mainly cysts, abscesses, widespread scarring

Data analysis was performed with Statistical Package for Social Science (SPSS) software, Version 25. Mean, and standard deviation was calculated for age (years) and duration of disease (months). Frequency and percentages were computed for gender, age classes, marital status, and educational status, and job status, duration of disease in groups, acne location, acne severity, and improvement in both groups. A post-stratification chi-square and Independent sample t-test test was applied with a p value of < 0.05 as significant to compare data of both groups.

RESULTS

Of the 122 patients with acne vulgaris, 61 were treated with Azithromycin, while 61 were treated with Doxycycline. In the Azithromycin group, male acne vulgaris patients were 36.1% (n=22) and female acne vulgaris patients were 63.9% (n=39), while in the Doxycycline group, male acne vulgaris patients were 31.1% (n=19) and female acne vulgaris patients were 68.9% (n=42). The mean age in the Azithromycin group was 20.9 ± 6.6 years, while the mean age in the Doxycycline group was 20.4 ± 6.6 years. The comparison of demographic variables between the two groups shows no significant differences, such as gender (p-value=0.565), mean age (p-value=0.672), age group comparison (p-value=0.835), marital status (p-value=0.389), educational status (p-value=0.900), job status (p-value=0.827), and residence (p-value=0.555) [Table 2].

Similarly, a comparison of acne vulgaris disease between the two groups does not show any significant difference, such that the mean duration of acne vulgaris in the Azithromycin and Doxycycline groups was 8.5 ± 2.6 and 7.9 ± 2.6 months (p-value=0.214), respectively. The most common acne vulgaris locations were the forehead, right cheek and left cheek in 44.3% (n=27) and 39.3% (n=24) of patients, followed by the forehead, right cheek, left cheek, nose, chin, chest and upper back in 23% (n=14) and 27.9% (n=17) of patients, the forehead, right cheek, left cheek and nose in 19.7% (n=12) and 23% (n=14) of patients, and the forehead, right cheek, nose and chin in 13.1% (n=8) and 9.8% (n=6) of patients (p-value=0.824) in the Azithromycin and Doxycycline group, respectively [Table 3].

Similarly, a comparison of acne vulgaris severity before treatment and after six weeks of treatment between the two groups does not show any significant difference. Before treatment, group II had the most common acne severity reported in 54.1% (n=33) and 52.5% (n=32) of patients, followed by group III in 31.1% (n=19) and 34.4% (n=21) of patients, and group IV in 14.8% (n=9) and 13.1% (n=8) of patients (p-value=0.917) in the Azithromycin and Doxycycline groups, respectively. After six weeks of treatment, grade I had the most common acne severity reported in 44.3% (n=27) and 44.3% (n=27) of patients, followed by grade II in 25 (41%) (n=25) and 24 (39.3%) (n=24) of patients, grade III in 8 (13.1%) (n=8) and 9 (14.8%) (n=9) of patients, and grade IV in 1.6% (n=1) and 1.6% (n=1) of patients (p-value=0.994) in the Azithromycin and Doxycycline groups, respectively [Table 4].

Table 2: Demographics in Acne Vulgaris Patients in the Azithromycin and Doxycycline Groups (n=122)

Demographic Variables		Azithromycin Group	Doxycycline Group	P-Value
Gender	Male	22 (36.1%)	19 (31.1%)	0.565
	Female	39 (63.9%)	42 (68.9%)	
	Mean ± SD	20.9 ± 6.6 (14-40)	20.4 ± 6.6 (14-40)	0.672
Age (Years)	14-20	33 (54.1%)	35 (57.4%)	0.835
	21-30	20 (32.8%)	17 (27.9%)	
	31-40	8 (13.1%)	9 (14.8%)	
Marital Status	Single	45 (73.8%)	49 (80.3%)	0.389
	Married	16 (26.2%)	12 (19.7%)	
	Primary	6 (9.8%)	7 (11.5%)	
Educational Status	Matriculation	26 (42.6%)	23 (37.7%)	0.900
	Intermediate	14 (23.0%)	17 (27.9%)	
	Graduate	15 (24.6%)	14 (23.0%)	
	Student	37 (60.7%)	39 (63.9%)	
Job Status	Housewife	10 (16.4%)	7 (11.5%)	0.827
	Indoor Job	8 (13.1%)	10 (16.4%)	
	Outdoor Job	6 (9.8%)	5 (8.2%)	
Residence	Rural	17 (27.9%)	20 (32.8%)	0.555
	Urban	44 (72.1%)	41 (67.2%)	

Table 3: Disease Details in Acne Vulgaris Patients in the Azithromycin and Doxycycline Groups (n=122)

Variables		Azithromycin Group	Doxycycline Group	P-Value
Duration of Disease (months)	Mean ± SD	8.5 ± 2.6 (3.5-12)	7.9 ± 2.6 (3.5-12)	0.214
Acne Location	Forehead + Right Cheek + Left Cheek	27 (44.3%)	24 (39.3%)	0.824
	Forehead + Right Cheek + Left Cheek + Nose	12 (19.7%)	14 (23.0%)	
	Forehead + Right Cheek + Nose + Chin	8 (13.1%)	6 (9.8%)	
	Forehead + Right Cheek + Left Cheek + Nose + Chin + Chest & Upper Back	14 (23.0%)	17 (27.9%)	

Table 4: Pre and Post Treatment Acne Severity in Acne Vulgaris Patients in the Azithromycin and Doxycycline Groups (n=122)

Acne Severity		Azithromycin Group	Doxycycline Group	P-Value
Pre-Treatment	Grade II	33 (54.1%)	32 (52.5%)	0.917
	Grade III	19 (31.1%)	21 (34.4%)	
	Grade IV	9 (14.8%)	8 (13.1%)	
Six Weeks After Treatment	Grade I	27 (44.3%)	27 (44.3%)	0.994
	Grade II	25 (41.0%)	24 (39.3%)	
	Grade III	8 (13.1%)	9 (14.8%)	
	Grade IV	1 (1.6%)	1 (1.6%)	
12 Weeks After Treatment	Grade 0	28 (45.9%)	43 (70.5%)	0.018*
	Grade I	27 (44.3%)	16 (26.2%)	
	Grade II	6 (9.8%)	2 (3.3%)	

* Statistically Significant P-Value

Table 5: Side Effects in Acne Vulgaris Patients in the Azithromycin and Doxycycline Groups (n=122)

Acne Severity		Azithromycin Group	Doxycycline Group	P-Value
Side Effects	Yes	7 (11.5%)	10 (16.4%)	0.433
	No	54 (88.5%)	51 (83.6%)	
	Nausea	3 (42.9%)	4 (40.0%)	
Type of Side Effects	Abdominal Pain	2 (28.6%)	2 (20.0%)	0.645
	Diarrhea	0 (0.0%)	2 (20.0%)	
	Headache	2 (28.6%)	2 (20.0%)	

After twelve weeks of treatment, a comparison of acne vulgaris severity between the two groups showed a significant difference (p-value=0.018). After twelve weeks of treatment, grade 0 was the most common acne severity reported in 45.9% (n=28) and 70.5% (n=43) of patients, followed by grade I in 44.3% (n=27) and 26.2% (n=16) of patients, and grade II in 9.8%

(n=6) and 3.3% (n=2) of patients in the groups of azithromycin and doxycycline, respectively [Table 4]. Side effects were compared between the two groups which also showed no significant differences (p-value=0.433) [Table 5].

Improvement in terms of clinical efficacy was significantly (p -value=0.006) higher in the Doxycycline group than in the Azithromycin group. Improvement in the Azithromycin group was reported in 45.9% ($n=28$) of patients, while improvement in the Doxycycline group was reported in 70.5% ($n=43$) of patients [Figure 1].

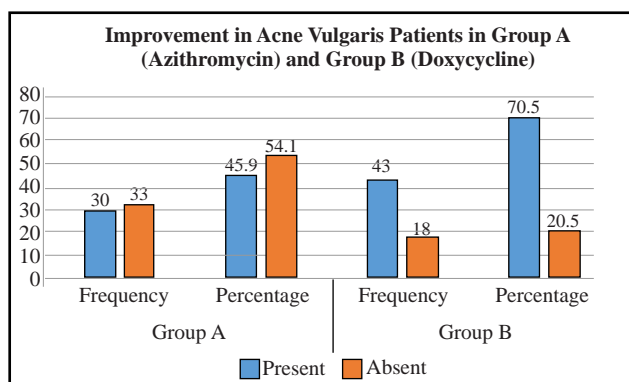


Figure I : Outcome in Acne Vulgaris Patients

DISCUSSION

Acne vulgaris is a common, chronic cutaneous inflammatory disorder of the pilosebaceous units, most commonly affecting the adolescents and young adults throughout the world^{16,17}. Despite the fact that acne vulgaris is not fatal, it can significantly affect the health of patients and cause various health problems, including irritation, pain, or scars after completion of treatment, and psychological problems, including anxiety, depression, or low self-esteem, and negatively affect the quality of life^{18,19}.

Early diagnosis with appropriate management is always essential for controlling acne vulgaris. The efficacy, tolerance, and side effects of present treatments (such as hormone therapy, retinoid, and antibiotics) vary, and they might not be equally successful for all patients. It is normal practice to prescribe antibiotics for at least 6 to 8 weeks to assess their efficacy in treating acne vulgaris, but in cases of failure to achieve complete resolution of acne vulgaris, antibiotics may be prescribed for 12 to 18 weeks or longer to achieve complete resolution^{12,13,20}.

Therefore, this study compares the clinical efficacy of azithromycin and doxycycline for 12 weeks in patients with acne vulgaris. Of the 122 patients with acne vulgaris, 61 were treated with Azithromycin, while 61 were treated with Doxycycline. Female patients were predominantly suffering from acne vulgaris compared to male patients. 63.9% ($n=39$) and 68.9% ($n=42$) of female patients and 36.1% ($n=22$) and 31.1% ($n=19$) of male patients were presented with acne vulgaris in

the Azithromycin and Doxycycline groups, respectively. The mean age in the Azithromycin group was 20.9 ± 6.6 years, while the mean age in the Doxycycline group was 20.4 ± 6.6 years. Most patients with acne vulgaris fall into the age group of 14-20 years. A similar female predominance and age group were reported by other researchers. A study by Arjel et al. reported 62.5% of female and 37.5% of male patients with acne vulgaris. The mean age was 20.1 ± 4.74 years in the Azithromycin group and 19.35 ± 4.89 years in the Doxycycline group¹⁵. A study by Raees et al. reported acne vulgaris in 55.3% of female and 44.7% of male patients and a mean age of 21.30 ± 4.93 years²¹. A study by Iqbal et al. reported acne vulgaris in 55.0% of female and 45.0% of male patients and a mean age of 21.24 ± 3.84 years²². Female predominance with acne vulgaris may be due to higher hormonal changes in females, particularly due to the menstrual cycle or polycystic ovary syndrome. This age group (< 20 years) indicates that most patients with acne vulgaris were in puberty and early adolescence, during which most hormonal changes occur, particularly increased androgen levels that trigger the sebaceous glands, resulting in the development of acne^{15,23,24}.

A comparison of acne vulgaris severity between the two groups showed no significant difference before treatment (p -value=0.917) and after six weeks of treatment (p -value=0.994), while a significant difference was seen after twelve weeks of treatment (p -value=0.018). Before treatment, group II was the most common acne severity reported in 54.1% ($n=33$) and 52.5% ($n=32$) of patients in the Azithromycin and Doxycycline groups, respectively. After six weeks of treatment, most patients improved to grade I [44.3% ($n=27$) and 44.3% ($n=27$)], and after twelve weeks of treatment, most patients improved to grade 0 [45.9% ($n=28$) and 70.5% ($n=43$)], in the Azithromycin and Doxycycline groups, respectively. Over all, improvement in terms of clinical efficacy was significantly (p -value=0.006) higher in the Doxycycline group (70.5%) as compared to the Azithromycin group (45.9%). A similar findings and efficacy of azithromycin and doxycycline in patients of acne vulgaris were reported by other researchers. A study by Arjel et al. reported the similar efficacy of azithromycin and doxycycline after six weeks of treatment (p -value=0.771), while a significant difference is seen after twelve weeks of treatment (p -value=0.035)¹⁵. A study by Raees et al. reported the similar efficacy of azithromycin (83.3%) and doxycycline (86.7%) in the management of acne vulgaris after twelve weeks of treatment²¹. A study by Iqbal et al. also reported the similar efficacy of azithromycin and doxycycline in the management of acne vulgaris after twelve weeks

of treatment²². The findings of both drugs indicate the equally effective management of acne vulgaris for a short period of time (six weeks), while doxycycline shows greater effectiveness in the management of acne vulgaris for a long period of time (twelve weeks). This indicates that doxycycline may be a superior option for long-term management of acne vulgaris, particularly in patients that require persistent improvement^{15,23,24}.

The comparison of side effects between the two groups also showed no significant differences (p-value=0.433). Side effects were non-significantly higher in the Doxycycline group (16.4%) as compared to the Azithromycin group (11.5%). The most common side effect was nausea reported in 42.9% (n=3) and 40% (n=4) of patients, followed by abdominal pain in 28.6% (n=2) and 20% (n=2) of patients, headache in 28.6% (n=2) and 20% (n=2) of patients, and diarrhoea in 0% (n=0) and 20% (n=2) of patients in the Azithromycin and Doxycycline groups, respectively. A study by Arjel et al. reported a similarly high rate of side effects in the management of acne vulgaris with doxycycline (22.5%) compared to azithromycin (15%)¹⁵. A study by Amatya et al. also reported a similarly high rate of side effects in the management of acne vulgaris with doxycycline (22.6%) compared to azithromycin (20%)²⁴. This indicates that doxycycline may be a superior option for twelve weeks of treatment of acne vulgaris but is also associated with more side effects than azithromycin.

There are some limitations associated with this quasi-experimental study. First, the small sample size and single-centre design of this study may limit generalisability of the study. Second, the lack of long-term monitoring to evaluate long-term treatment efficacy and potential side effects of Azithromycin and Doxycycline in the management of acne vulgaris are shortcomings of our study.

CONCLUSION

The clinical efficacy of azithromycin and doxycycline was similar after six weeks of treatment, while doxycycline showed significantly higher clinical efficacy than azithromycin after twelve weeks of treatment in the management of acne vulgaris. This indicates that doxycycline may be a superior option for long-term management of acne vulgaris, particularly in patients that require persistent improvement.

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Authors' Contribution: **NK** developed the concept of this research; **NK** and **FAK** searched literature and drafted the manuscript; **TI** provided supervision, financial support, and critical guidance; **SAA** contributed in the validation of data and final review of the manuscript.

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