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Original Article

Topical Adapalene Versus Adapalene Plus Benzoyl Peroxide in Acne Vulgaris

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Abstract *- Acne Vulgaris is a common dermatological condition, having adverse effects on both physical and mental health. This study compares the efficacy of topical Adapalene (0.1% gel) given as Monotherapy versus its combination with 2.5% Benzoyl Peroxide in patients with mild Acne. A randomized controlled trial was conducted at the Dermatology Unit of Hayatabad Medical Complex, Peshawar, involving 162 patients divided into two equal treatment arms. Group A patients received Adapalene Monotherapy, while Group B patients received the combination of both drugs. Efficacy was gauged through the use of Global Acne scores and the Chi-square approach for determining statistical significance of the outcomes. The findings from this study indicated that the rate of improvement among those receiving the combination was significantly higher (72.8%) when compared with Monotherapy (51.9%), with a p-value of 0.006. Subgroup analysis demonstrated that combination therapy resulted in better outcomes for females, patients within the younger age group, and non-obese individuals. The synergistic anti-inflammatory and bactericidal action of the dual regimen is highlighted in the test results, which support the adoption of the dual regimen as one of the more successful treatment options for mild Acne. The implication of this study would be of significant importance for the region-specific evidence in dermatological practice in Pakistan, impacting clinical care procedures and improving the quality of life of such patients.*

Keywords *- Acne Vulgaris, Adapalene, Benzoyl Peroxide, Combination Therapy, Dermatology, Randomized Controlled Trial, Skin Care.*

1. Introduction

Acne Vulgaris (AV) is a persistent inflammatory skin disease involving the Pilosebaceous units with the hair follicles and sebaceous glands. It presents in different ways, including comedones, papules, pustules, nodules, cysts, etc. [1]. It is a common dermatological condition in younger adolescents and early adult persons [2]. It is worldwide, with an estimated global prevalence of 9.4 % and is the most common skin disease [2]. AV is treated using topical or oral drugs, depending on the disease's kind or severity. Retinoids, Benzoyl Peroxide, and various antibiotics are topical substances, although Cyproterone Acetate, Antibiotics, and Retinoids are also taken orally [3]. C Acne is referred to as a self-limiting condition by many, but it is capable of causing physical scarring and psychosocial problems when not treated [4].

To treat the mild Acne Vulgaris, this study compares the efficacy of Topical Adapalene (0.1% gel) applied alone to Topical Adapalene (0.1%) plus Benzoyl Peroxide (2.5%). This study will compare the efficacy of Topical Adapalene used as a Monotherapy and a combination of Topical Adapalene with Benzoyl Peroxide in the treatment of moderate Acne Vulgaris. The outcomes of this study will provide region-specific information that will be useful in aiding local dermatologists in selecting the optimal therapeutic options to improve patient outcomes. Suppose the combination therapy proves to be superior. In that case, this may establish a new standard of care for managing moderate Acne in this region by helping to reduce the burden associated with acne complications.

Despite the widespread use of Adapalene and Benzoyl Peroxide in acne management, there is a noticeable lack of comparative research from Pakistan, especially in Khyber Pakhtunkhwa, where variations in climate, skin characteristics, and healthcare access may influence treatment success. This gap makes it difficult for dermatologists to rely solely on international evidence when selecting the most effective regimen for local patients. The present study addresses this problem by directly comparing Adapalene Monotherapy with its combination therapy in a regional population. The study's novelty emerges from generating locally relevant clinical data that can support more accurate, evidence-based decision-making for mild to moderate Acne Vulgaris in this setting.

2. Literature Review

Acne's pathogenesis is multifactorial, including Hyper-Keratinization, Inflammation, Excessive Sebum Production, and Follicular and Cutaneous Bacterium Acnes Colonization. Hormones change during puberty, which can be the root cause behind stimulating the sebaceous glands, leading to excess sebum production. Moreover, the inflammatory reaction brought on by C. acnes is also essential for the development of these lesions, which are not only uncomfortable but, in extreme cases, can cause deformity [5].

Teenagers and young professionals are commonly affected by Acne Vulgaris. It is anticipated that prevalence rates among teenagers will vary from 35 percent to 90 percent or higher. Preadolescent Acne, the normal course of this ailment, can start as early as age seven to twelve and be resolved by the time a person enters their third decade. However, in certain instances, Acne may appear into adulthood or even manifest during the early stages of life [6].

The infected person's face, chest, neck, upper arms, and upper back are areas where Acne typically appears. These are the regions with the highest concentration of large, hormone-sensitive sebaceous glands. Starting with comedones and working up from grade 1 to grade 4, the following list of polymorphic lesions can be used to diagnose Acne: 1st grade: This grade, which is also called “Comedones," is separated into two categories: open and closed. The accumulation of Sebum in the pilosebaceous orifice leads to the development of open comedones. The dilated central follicular orifice of these papule-shaped comedones contains keratotic material that might be grey, brown, or black. Conversely, closed comedones grow when sebum and keratin build and clog the Pilosebaceous Orifice, which is situated beneath the skin's surface. They have a wide range of colours, and their smooth, dome-shaped papules may be skin-coloured, yellowish, or greyish. Inflammatory lesions with Erythema and visible as a small papule are categorized as 2nd-grade [7].

Several parameters are used to determine the severity of Acne. A comprehensive evaluation of acne severity needs to consider several factors, including the patient's psychological impact, response to treatment, type of clinical lesions, scarring, draining lesions, or sinus tracts. Those with a diagnosis of nodular inflammatory Acne are one category of individuals with severe Acne.

Similar to this, people with inflammatory and scarring pustules are also considered to have severe Acne, even if they do not have any nodules within them [8]. Based on the disease's normal course, its variations, and atypical symptoms, complete information on the patient's past should be acquired. The following components must be included in the data: the age at which the condition initially manifested and the patient's present age; the patient's medical history; the medication history; the family history of Acne; the female's menstruation history (related to flare-ups); The patient's skincare routine (using comedogenic products); previous treatments and the patient's response; systemic symptoms (such as Fever, Myalgia, and Arthralgia), especially in cases of severe Acne; signs of virilization in young children and females (such as hirsutism, male pattern hair loss, deepening of the voice, or genital enlargement); and the psychological effects of the illness [9].

Topical therapy continues to be the foundation in treating mild to moderate Acne Vulgaris. Antibiotics, Benzoyl Peroxide (BPO), and Retinoids are common topical treatments. Adapalene falls under the class of Retinoids, which work to modulate keratinization and aid in the anti-inflammatory process and comedolytics. In contrast, Benzoyl Peroxide is a bactericidal agent for C. acnes and decreases the risk of developing resistance when combined with antibiotics [10].

Adapalene is a 3rd-generation synthetic retinoid that provides both comedolytic effects and anti-inflammatory[11]. It has a role in both the acute and maintenance phases and improves the pigmentation and scarring, too. Benzoyl Peroxide has excellent Antimicrobial action and is often used in combination with other treatments to enhance response. It effectively reduces C. acnes and contributes to improving follicular blockage due to exfoliation of the outer skin layers. However, it causes irritation of the skin and dryness, too, which may limit its use in some patients unless combined with other agents such as Adapalene, which improve its tolerability.[12].

Research has shown that the use of Adapalene in combination with Benzoyl Peroxide is far more effective than the use of either treatment modality separately. This combination works dual functions: an Anti-Inflammatory effect and the prevention of bacterial growth. Keating et al. discovered that the efficacy of Adapalene 0.1% gel, when combined with Benzoyl Peroxide 2.5% gel, was significantly higher, with an overall success rate of approximately 75%, as compared to only 54% of Adapalene used alone [13].

Moderate Acne, which includes both non-inflammatory and inflammatory lesions, needs prompt and effective treatment to avoid scarring and long-term effects. The Global Acne Severity Scale defines moderate Acne as having a patient's global acne severity score ranging from 19 to 30 [14]. Management of moderate Acne is highly necessary not only to improve the condition of the skin but also to reduce psychological distress among affected individuals. [15].

3. Evaluation and Management of Acne Fulminans

3.1. Laboratory Tests and Clinical Assessment

The patients with acne fulminans should be carefully assessed. This assessment involves tests for C-reactive proteins, liver function, complete blood count, and erythrocyte sedimentation rate. Sometimes this is even more important in patients with systemic manifestations.

4. Systemic Manifestation Importance

Besides these, it is recommended that women take pregnancy tests using either serum or urine, serum cholesterol and triglyceride levels are also measured, and some radiographs should be done if there are some indications of joint or bone involvement.

4.1. Isotretinoin Pre-treatment Investigation

This extensive evaluation tries to determine how much Acne Vulgaris has impacted the body and also helps in the preparation of the medicine Isotretinoin [16].

5. Counseling and Education of Patients:

5.1. Treatment Goals and Expectations

Irrespective of the seriousness of Acne Vulgaris, thorough Patient counselling should be the first line of treatment. Discussions regarding the nature of the illness, advice on proper skin care techniques, and realistic expectations for treatment should all be part of this counselling. The following are some of the most important topics that should be discussed during patient counselling:

5.2. Monitoring and Compliance Importance

It is possible that the lesion's improvement may be delayed, and the primary goal of treatment is to prevent the development of new lesions and to eliminate existing ones. To determine whether the treatment is effective, the patient must be monitored for at least two to three months. If the treatment is effective, the response may not be total clearance, but rather a noticeable decrease in the number of active lesions. This clarification is intended to help patients avoid an early stopping of their course of treatment because they believe it is ineffective [17].

5.3. Adjustment and Maintenance Therapy

Acne treatments are typically suppressive, requiring long-term maintenance medicine [17]. The same treatment may have various reactions in different people. Because of this, adjustments to the treatment plan will probably be necessary to achieve the best outcomes in terms of the treatment's efficacy and safety.

5.4. Recommendations for Skin Care

Although soaps often have a higher pH than the skin's, it is critical to promote the use of gentle skin cleansers rather than harsh soaps or scrubs. The skin may become dry and inflamed because of the higher pH. Excessive skin washing and plucking should be avoided because they may promote the production of new acne lesions and scars [17]. To avoid clogged pores, use non-comedogenic skin care products such as gels and fluids.[17].

6. Moderate to Severe Acne Classification and Treatment

6.1. Clinical Features and Psychological Impact

Acne Vulgaris is considered moderate to severe when it is characterized by evident comedones, signs of inflammation such as papules, pustules, and nodules that may subsequently result in scars, and the involvement of several body areas. Assessing the severity of Acne also involves considering its psychological impact on the individual. Even mild comedonal Acne can lead to considerable emotional distress, which may warrant a more aggressive treatment strategy than that for moderate-to-severe cases.

6.2. Systemic and Topical Treatment Approaches

Both topical and systemic treatments are included for the main treatments of moderate-to-severe Acne. Systemic treatments for widespread Acne typically involve oral antibiotics (often tetracyclines), hormonal treatments like Spironolactone or Oral Contraceptives for women, and oral isotretinoin. Generally, systemic treatment is paired with topical treatments, except when oral isotretinoin is used as a standalone option [18].

7. Therapy of Oral Antibiotics in Acne Management

7.1. Tetracycline's Role

Cutibacterium acnes growth in the pilosebaceous unit can be efficiently reduced due to the use of oral antibiotics. Tetracyclines have an anti-inflammatory effect, which is why they are often the go-to choice for treating Acne Vulgaris.

7.1.1. Alternative Antibiotics Cases

If Tetracyclines are ineffective or cause side effects, alternative options such as Macrolides, Cephalosporins, Penicillin, or Trimethoprim-Sulfamethoxazole may be considered.

7.1.2. Preventing Antibiotic Resistance

Treatment duration should be as short as possible to reduce the risk of antibiotic resistance and should ideally be limited to 3 to 4 months. This can be aided by incorporating a topical retinoid, which facilitates the cessation of the Antibiotic, or adding Benzoyl Peroxide during treatment [2].

7.1.3. Safety Considerations and Side Effects

The Tetracyclines commonly recommended for treating Acne include Doxycycline, Minocycline, and Sarecycline. It

should be emphasized that Tetracyclines, such as Doxycycline, are contraindicated in children under the age of 8 years or pregnant women due to a possible phenomenon of dental staining in developing teeth. Prolonged treatment with oral antibiotics can lead to side effects such as Gastrointestinal Discomfort, Esophagitis, and Pseudotumor Cerebri, a condition characterized by increased intracranial pressure of unknown origin. Additionally, Doxycycline increases sun sensitivity; therefore, sun protection is necessary during therapy. With appropriate precautions and in combination with other topical treatments, therapy outcomes can be enhanced and risks reduced.[2].

8. Hormonal Therapy for Acne

8.1. FDA Approval With Oral Contraceptives

The US Food and Drug Administration approved three oral contraceptives for the treatment of Acne. These possibilities include Ethinyl Estradiol 20/30/35 mcg in combination with 1 mg of Norethindrone, 35 mcg in combination with 180/215/250 mcg of Norgestimate, and 20 mcg in combination with 3 mg of Drospirenone.

8.2. Progestin-Only Contraceptives' Limitations

Progestin-only contraceptives, on the other hand, such as low-dose oral tablets that contain Androgenic Progestins like Desogestrel or Norethindrone, are not considered very effective and may exacerbate Acne Vulgaris.

8.3. Contraindications of Hormonal Therapy

Oral contraceptives should not be used as a treatment for those who have a history of Thromboembolic events or underlying Thrombophilic Diseases [2].

9. Managing Complications Associated with Acne

9.1. Post-Inflammatory Hyperpigmentation

Acne Vulgaris complications must be treated with a range of approaches tailored to address specific issues as they arise. The following are some common problems and how they are addressed: Post-inflammatory hyperpigmentation can be treated with photoprotection, topical treatments like Retinoids, Azelaic Acid, and Hydroquinone, as well as superficial chemical peels such as Glycolic or Salicylic Acid.

9.2. Post-Inflammatory Erythema

Treatment options for post-inflammatory Erythema include intense Pulsed Light (IPL) Therapy, Fractional Microneedling, Radiofrequency, Pulsed-Dye Lasers, and topical use of 5% Tranexamic Acid.

9.3. Acne Scar: Rolling, Boxcar, and Ice Pick

Ice-pick scars can be treated with techniques such as ablative fractional laser or erbium resurfacing, filler injections, punch elevation or excision, and Chemical Restoration Of Skin Scars (CROSS) using Trichloroacetic Acid. Successful treatments for rolling scars include fillers, needle-free pneumatic solution injections, and subcision.

9.4. Advanced Treatment Modalities

The treatment of acne scars, ablative fractional laser therapy in conjunction with subcision, can be especially helpful. Treatments for boxcar scars include filler injections, Erbium Laser Therapy, Deep Scar Excision, and Needle-Free Pneumatic Solution Injections [2].

10. Acne-like Disorders and Differential Diagnoses

10.1. Angiofibroma Facial

A hallmark of Tuberous Sclerosis, Facial Angiofibroma manifests as pink or red papules that are primarily observed on children's cheeks and nose [18].

10.2. Pseudofolliculitis Barbae

Pseudofolliculitis Barbae mainly affects people with tightly curled hair and is characterized by pustules, inflammatory papules, and scarring in the facial hair area [18].

10.3. Nervus Comedonicus

A cluster of comedones is diagnostic of Nevus comedonicus, which typically manifests at birth or in early infancy [18].

10.4. Sebaceous Hyperplasia

Small, yellowish, slightly indented pimples that are frequently found on the forehead and cheeks are a sign of Sebaceous Hyperplasia.

10.5. Adnexal Tumors

Trichoepithelioma, Trichodiscoma, and Fibrofolliculoma are examples of Adnexal Tumours that manifest as flesh-coloured papules on the skin of the face [18].

10.6. Favre Rancouchot Syndrome

Comedones on the upper outer cheeks are a hallmark of Favre-Racouchot syndrome, which is usually observed in elderly persons due to prolonged sun exposure [18].

Acne can significantly impact mental health, even though it is not an imminent threat to life. Although the prognosis is usually good with appropriate treatment, people who have Acne and the scars it leaves behind are more likely to suffer from worry and sadness [18].

11. Medical Conditions Associated with Acne

11.1. Polycystic Ovarian Syndrome

In certain people, underlying medical conditions such as Polycystic Ovarian Syndrome might have an impact on

Acne. Acne management and preventing disfigurement depend on the early detection and treatment of these underlying causes [2].

11.2. Hormonal Imbalance and Androgenic Influence

The pilosebaceous unit is impacted by the chronic inflammatory disease known as Acne Vulgaris. It often manifests during puberty and is caused by either increased sensitivity to androgens or increased androgen synthesis from the gonads and adrenal glands.

12. Pathophysiology of Acne Vulgaris

12.1. Role of Androgens and Sebaceous Gland Activity

Excessive keratinization of hair Follicles and expansion of the Sebaceous Glands result in the increased production of Sebum, and Keratinocyte Clumping, which collectively form a follicular clog and can all block the Pilosebaceous Canal. Androgens primarily regulate these processes.

12.2. Follicular Hyperkeratosis and Microcomedo Formation

When Follicular Hyperkeratosis disrupts the usual flow of Sebum to the skin's surface, a Microcomedo develops.

12.3. Sebum Accumulation and Follicular Obstruction

The blockage gets worse as Sebum accumulates, resulting in a plugged [19]. Neonatal Acne typically shows up shortly after birth, usually within the first six weeks, and is more common in male infants. This condition is thought to arise from the stimulation of Sebaceous Glands by hormones from both the mother and the baby, as well as the presence of Malassezia species in those glands. It is marked by small, raised bumps and pustules, often located on the forehead, cheeks, and nose. Fortunately, this condition usually clears up on its own within a few weeks to several months [20].

13. Materials and Methods

The study is based on a randomized controlled trial that was conducted at the Hayatabad Medical Complex's dermatology unit. Using Open Epi, the sample size was determined while accounting for prior efficacy rates of 54% for Adapalene by itself and 75% for Adapalene with Benzoyl Peroxide. A 95% confidence interval and an 80% test power were used for this. With 81 participants per group, the final sample size was 162.

The inclusion criteria and exclusion criteria are the two groups into which the sample is divided. Males and females over the age of 18 who have received a dermatologist's diagnosis of Acne Vulgaris are included in the inclusion group. Patients with Conglobate Acne, Secondary Acne, or Severe Acne, and Acne fulminans, are excluded since they all needed systemic treatment and had a history of Benzoyl Peroxide or Adapalene Hypersensitivity—individuals who, during the prior four weeks, have taken any systemic or topical acne medication.

Ethical approval was secured from the hospital's ethical committee before data collection. Patients were informed about the study's goals and potential benefits, and their confidentiality was guaranteed. All patients were provided with written informed consent. They were then randomly assigned to two groups through block randomization. One group received Adapalene Monotherapy (0.1% gel), applying a pea-sized amount each night after washing their face with mild soap. The second group used a combination of 0.1% Adapalene and 2.5% Benzoyl Peroxide (BPO) gel, applying a pea-sized dose overnight after cleaning the face. Both medications were given regularly for 12 weeks. Every four weeks, patients were checked in, their therapy responses were documented, and data were entered into pre-made proformas. A consultant dermatologist with at least five years of post-fellowship experience measured the global acne score during the twelfth week of treatment to determine its effectiveness. Every piece of data was entered into the attached pro forma. The proforma included information about the outcome variable or efficacy.

SPSS version 23 was utilized for data entry and analysis. The mean and standard deviation for age, lesion count, BMI, and duration of illness were calculated. For categorical variables such as gender, age groups, disease severity, efficacy (present/absent), and obesity (obese/non-obese), frequencies and percentages were computed. Efficacy in both groups was assessed using the chi-square test ($p \leq 0.05$). Effect modifiers such as age, gender, socioeconomic status, obesity, disease severity, and duration of illness were controlled through tiered tables, and their influence on outcomes was subsequently evaluated using the post-stratification chi-square test. For every test, the significance level was set at $P \leq 0.05$.

14. Results and Discussion

14. Results

There were 162 patients in this study. According to the results, patients between 19 and 25 were more prevalent in both groups. Nevertheless, this was not statistically significant, as evidenced by the p-value of 0.87 (Table 1). This study shows a female-to-male ratio of 35:15 and a non-significant p-value of 0.74; the study's proportion of female patients was higher than that of male patients in both groups. Most patients in both groups had mild Acne, were non-obese, and were from middle-class backgrounds; nevertheless, the p-value was insignificant, except for socioeconomic status, which had a p-value of 0.06 (Table 1). Forty-two patients in group A and fifty-nine patients in group B benefited from the treatment. Compared to group A (Adapalene Monotherapy), patients in group B (Adapalene Monotherapy with Benzoyl Peroxide) demonstrated noticeably superior efficacy ($P = 0.006$) (Table 1).

Group B had a higher efficacy rate in the 19–25 age group, which was statistically significant (p-value 0.04). There was no discernible variation in efficacy between the age groups of 25 and older (Table 1). Group B had considerably higher efficacy in female patients (p-value 0.005), according to gender-wise classification; however, there was no discernible difference in efficacy between the two groups in male patients (Table 1). With a p-value of 0.04 for mild acne vulgaris, this study demonstrated a significantly higher efficacy of combination therapy (Table 1).In non-obese individuals, Group B had considerably greater efficacy (p-value 0.002), whereas in obese patients, there was no difference in efficacy (Table 1). According to the socioeconomic stratification, group B demonstrated substantial efficacy in the middle and upper classes (p-values of 0.02 and 0.007, respectively). However, there was no discernible difference in the lower classes (Table 1). There was little difference in efficacy across the stratification of disease duration (Table 1).

Table 1. Stratification of Comparison of Efficacy Between Both Groups with Respect to Age, Gender, Severity of Diseases, Obesity, Socioeconomic Status, and Duration of Diseases

Age distribution			Efficacy		Total	P value
			Present	Absent		
19 to 25 years	Groups	Group A(Adapalene monotherapy)	26	20	46	0.04
			56.5%	43.5%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	36	11	47	
			76.6%	23.4%	100.0%	
	Total		62	31	93	
			66.7%	33.3%	100.0%	
> 25 years	Groups	Group A (Adapalene monotherapy)	16	19	35	0.06
			45.7%	54.3%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	23	11	34	
			67.6%	32.4%	100.0%	
	Total		39	30	69	
			56.5%	43.5%	100.0%	
Gender	Efficacy					
Male	Groups	Group A (Adapalene monotherapy)	17	15	32	0.339
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	22	12	34	
			64.7%	35.3%	100.0%	
Total			39	27	66	
			59.1%	40.9%	100.0%	
Female	Groups	Group A(Adapalene monotherapy)	25	24	49	0.005
			51.0%	49.0%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	37	10	47	
			78.7%	21.3%	100.0%	
	Total	62	34	96		
		64.6%	35.4%	100.0%		

Severity of disease		Efficacy				
		Present	Present	Absent	Total	P value P
Mild	Groups	Group A (Adapalene monotherapy)	16	15	31	0.04
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	25	8	33	
			75.8%	24.2%	100.0%	
		Total	41	23	64	
			64.1%	35.9%	100.0%	
Moderate	Groups	Group A (Adapalene monotherapy)	26	24	50	0.05
			52.0%	48.0%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	34	14	48	
			70.8%	29.2%	100.0%	
	Total		60	38	98	
			61.2%	38.8%	100.0%	
Obesity		Efficacy			Total	P value
Yes	Groups	Group A (Adapalene monotherapy)	8	6	14	0.86
			57.1%	42.9%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	12	8	20	
			60.0%	40.0%	100.0%	
		Total	20	14	34	
			58.8%	41.2%	100.0%	
No	Groups	Group A (Adapalene monotherapy)	34	33	67	0.002
			50.7%	49.3%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	47	14	61	
			77.0%	23.0%	100.0%	
		Total	81	47	128	
			63.3%	36.7%	100.0%	
Socioeconomic status			Efficacy		Total	P value
			Present	Absent		
Lower class	Groups	Group A (Adapalene monotherapy)	13	10	23	0.66

			56.5%	43.5%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	10	10	20	
			50.0%	50.0%	100.0%	
		Total	23	20	43	
			53.5%	46.5%	100.0%	
Middle class	Groups	Group A (Adapalene monotherapy)	23	17	40	0.02
			57.5%	42.5%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	37	9	46	
			80.4%	19.6%	100.0%	
		Total	60	26	86	
			69.8%	30.2%	100.0%	
Upper class	Groups	Group A (Adapalene monotherapy)	6	12	18	0.007
			33.3%	66.7%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	12	3	15	
			80.0%	20.0%	100.0%	
		Total	18	15	33	
			54.5%	45.5%	100.0%	
Duration of disease (Years)			Efficacy		Total	P value
			Present	Absent		
3 to 5	Groups	Group A (Adapalene monotherapy)	27	21	48	0.06
			56.2%	43.8%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	44	16	60	
			73.3%	26.7%	100.0%	
> 5	Groups	Group A (Adapalene monotherapy)	15	18	33	0.06
			45.5%	54.5%	100.0%	
		Group B (Adapalene monotherapy plus Benzoyl Peroxide)	15	6	21	
			71.4%	28.6%	100.0%	
	Total		30	24	54	
			55.6%	44.4%	100.0%	

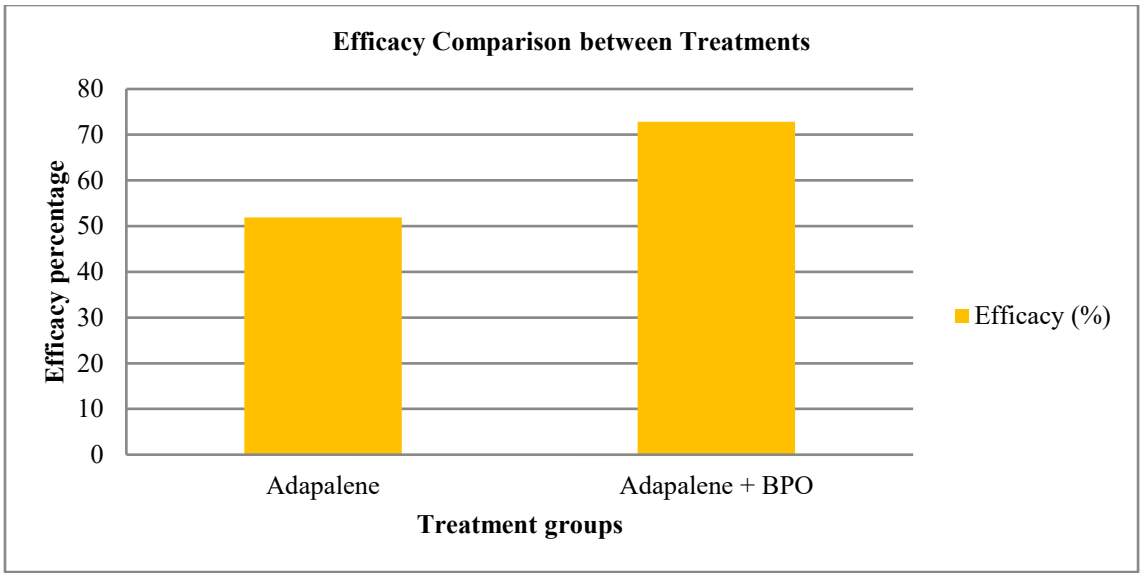

Fig. 1 Comparison Between Topical Adapalene and Adapalene Plus Benzoyl Peroxide.

14.2. Discussion

The purpose of this study was to evaluate the efficacy of topical Adapalene 0.1% gel therapy alone against Adapalene 0.1% + Benzoyl Peroxide 2.5% gel in individuals with moderate Acne Vulgaris. According to results, combination therapy was statistically considerably more effective (72.8%) than Monotherapy (51.9%) ($p = 0.006$). International studies like Keating et al., which indicated success rates of 75% and 54% for combination and Monotherapy, respectively, are in line with these findings. This demonstrates that the best results in treating inflammatory Acne are obtained when Retinoid and Antibacterial agents are combined.

The complementary mechanisms of Benzoyl Peroxide and Adapalene are responsible for the combo regimen's increased efficacy. Benzoyl Peroxide quickly lowers the number of C. acnes and provides extra comedolytic and keratolytic advantages, while Adapalene encourages the normalization of follicular Epithelial Desquamation and possesses anti-inflammatory properties. This synergy not only increases lesion clearance but also lowers the chance of bacterial resistance when compared to Monotherapy with either antibiotics or retinoids.

International guidelines recommend Adapalene-BPO as a first-line treatment for Mild Acne Vulgaris, and it was well-tolerated among participants. The patient compliance and relatively quick improvement show the usefulness of this regimen in clinical dermatology, particularly in resource-poor areas such as Khyber Pakhtunkhwa, where systemic medication is not always accessible. This study fills an important gap in regional literature by presenting efficacy data from the local population, considering demographic, environmental, and sociocultural factors relevant to northern Pakistan. It indicates the need for local research to guide population-specific treatment protocols. Of course, there are some limitations even with positive findings: the trial lasted only six months, and it did not measure long-term outcomes like scarring, post-inflammatory hyperpigmentation, and recurrence rates. Further research has to consider quality-of-life measures while including longer follow-ups to get a wholesome view of treatment impact. The p-value of 0.006 showed that Group B, which was given the combination, was significantly superior to Group A, which showed an improvement of 51.9%. This means that the combination of Bactericidal and Anti-Inflammatory properties of Benzoyl Peroxide and Adapalene results in better outcomes when treating mild Acne. The research underscores the role of evidence-based practices in clinical dermatology in improving patient outcomes and reducing mental agony related to Acne.

15. Conclusion

In the treatment of moderate Acne Vulgaris, combination therapy with Adapalene 0.1% and Benzoyl Peroxide 2.5% was significantly more effective at 72.8%, as compared to Adapalene Monotherapy at 51.9% ($p=0.006$). This implies that Benzoyl Peroxide's Antibacterial and anti-inflammatory qualities improve treatment effectiveness.

Conflicts of Interest

Regarding the publishing of this paper, the authors state that they have no conflicts of interest. Pharmaceutical corporations, medical institutes, or other groups did not financially or commercially influence this study, which was carried out independently. The researchers' data collection and analysis served as the exclusive basis for all findings and conclusions that were presented.

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