

# Acne and Its Treatment Options - A Review

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## ABSTRACT

Sebaceous units in the skin are affected by acne, a reactive skin disorder that is common. It may cause the patient to have major psychological effects as well as severe skin scarring. Due to the early onset of puberty, acne is more common in females aged 12 and under, but it also shows up more in boys aged 15 and up according to recent observations made in younger patients. In most cases, acne clears up in the patient's early twenties; nevertheless, acne can persist into adulthood and is more common in women. Acne vulgaris has a complex pathophysiology that is influenced by both internal and environmental factors. Conversely, the underlying causes are increased, sebum production and abnormal desquamation of epithelial cells. The progression of acne lesions is the creation of the microcomedo, or blockage of the follicular canal. It is exciting to consider that our expanding knowledge of the pathophysiology of acne may lead to the development of novel therapeutic alternatives. Inhibitors of retinoic acid metabolism, blue light, photodynamic treatment, and Th-1 cytokine inhibitors are a few of the inventive and difficult options accessible. Acne is also brought on by changes in the hormones, testosterone and estrogen, and there are numerous androgens, other reasons why acne forms.

**Key Words:** acne, preventive measures, treatment, antibiotics, hormonal therapy

## INTRODUCTION

One frequent chronic inflammatory skin disorder is acne vulgaris. Approximately 80% of young adults and adolescents have it. It is a condition that affects the skin's pilosebaceous units and can cause lesions that are either inflammatory or non-inflammatory (1,2,3).

Numerous variables might trigger the onset of acne or exacerbate it. Genetics, the male sex, youth, stress, smoking, and comedogenic drugs such as androgens, halogens, corticosteroids, and pore-clogging cosmetics are a few of these causes. According to earlier studies, genetics and comedogenic hormones - particularly androgens - produce abnormally high

amounts of sebum, which exacerbate acne lesions (1,3,4).

### Causes of acne:

It remains to be determined how diet and acne are related. Research has indicated a potential correlation between milk consumption and an increase in acne lesions; however, the evidence is not very strong (5,6).

One of the most prevalent skin conditions is acne. Numerous genetic and epidemiologic studies have produced strong evidence on the role that heredity plays in the development of acne (7-11).

## **IMPACT OF ACNE ON MENTAL HEALTH**

The current study's findings demonstrated the detrimental effects of acne vulgaris on patients' psychological well-being, showing a correlation between the skin condition and all psychiatric symptoms, including somatization, obsession, sensitivity, depression, anxiety, hostility, phobia, paranoid ideation, and psychoticism. Conversely, individuals with acne scored higher on all SCL-90 items compared to controls. Furthermore, the worst psychological effects were associated with acne that was more severe and persisted longer. Our results may corroborate those of several studies that have looked into the connection between psychological problems and acne. Acne patients scored considerably higher than controls on all SCL-90 items in Abdel-Hafez research (12).

There was a significant psychological morbidity among acne patients, with shame, poor self-esteem, negative self-image, self-consciousness, frustration, and rage being the most common symptoms (13).

### **Home remedies for acne treatment**

#### **Turmeric**

Most people agree that using turmeric as a home treatment for acne works well. Mix two teaspoons of coconut oil with a ¼ teaspoon of turmeric powder. Thoroughly stir the mixture. Apply the concoction to your face. Give the mixture fifteen minutes to sit. Next, wash with water.

#### **Raw papaya fruit**

It helps keep skin smooth by removing extra lipids and dead skin cells from the skin's surface. Papain, another enzyme found in papayas, helps to prevent pus development and lessen inflammation. You need one fresh papaya.

#### **Aloe vera gel**

Aloe vera gel has calming qualities and antimicrobial qualities that operate as an anti-inflammatory, effectively lowering acne's redness and swelling. Adequately

apply aloe vera gel to the regions of the skin affected by acne.

#### **Acetyl salicylic acid, or aspirin**

Acetyl salicylic acid, or aspirin, contains salicylic acid, which is utilized in acne treatments. Aspirin helps reduce inflammation and dry up. Aspirin can be mashed with a little water to make aspirin tablet paste, or four tablets can be dissolved in two tablespoons of water.

#### **Orange peel**

Because orange peel contains a high amount of vitamin C, it helps the skin stay healthy by promoting the formation of new, healthy cells. You'll need two orange peels and fresh, clean water.

Red wine and grapes, may be useful treatment for acne disorder when combined with currently prescribed medications (14).

## **PREVENTIVE MEASURES**

Avoid mental stress as it can impact hormone levels like cortisol and adrenaline, which exacerbate acne. This is one way to prevent acne from getting worse.

Steer clear of hot, muggy weather at all times since it might exacerbate acne.

Try not to use lubricating lotions, moisturizing creams, or any makeup products with oil content since these can have clogging of your pores.

Avoid using oily hair products because they have an identical effect to makeup that is based on oil.

Because of specific hormonal changes, girls and women with acne are more prone to experience worsening of their condition prior to the onset of the menstrual cycle.

Avoid popping pimples because doing so increases the likelihood that the acne may worsen. (15)

## **TREATMENT**

### **Salicylic acid**

The active component of many over-the-counter (OTC) acne treatments is salicylic acid. It's a beta-hydroxy acid with anti-inflammatory and comedolytic qualities.

Although it can be a supplement to regimens treating more severe acne, it is primarily used for mild acne (16).

### Phototherapy and laser treatment

The development of laser and light therapy as acne treatments is still in its infancy. These therapies either lessen inflammation, function of the sebaceous glands, or P. acnes levels (17), It is yet unclear if light-based therapies are safe and effective over the long run (18,19).

### Hormonal Therapy

Only women should use hormonal therapy for acne. Its goal is to lower androgen levels, which are linked to stimulating sebaceous follicles. Oral contraceptives function by preventing testosterone synthesis from the ovary and adrenal glands (20,21). Treatment of Hormonal acne is shown in Figure 1.



Figure 1: Treatment of Hormonal Acne

### Retinoids

Topical retinoids can be used as a maintenance treatment, in conjunction with more severe forms of acne, or as a monotherapy for inflammatory acne. In general, they lessen sebum production, regulate the development of new lesions and comedones, regulate the generation of microcomedones, and restore normal desquamation of the epithelium. They

suppress comedone formation and specifically target microcomedones. Additionally, they might have anti-inflammatory qualities (22).

### Benzoyl peroxide

Can be bought over-the-counter and is reasonably priced. Compared to tretinoin, it works better on papules but less well on comedones (23) When topical antibiotics and benzoyl peroxide are combined, individuals with P. acnes colonization experience increased efficacy and decreased antibiotic resistance. The formulations, which come in gel form, include 3% erythromycin and 5% benzoyl peroxide (Benzamycin) and 1% clindamycin with 5% benzoyl peroxide (BenzaClin). Both preparations work just as well for treating acne (24).

### Azelaic Acid

This substance is a dicarboxylic acid with keratolytic and bacteriostatic activities. When treating acne accompanied by post-inflammatory hyperpigmentation, azelaic acid (Azelex) may be especially helpful (25).

### Photocuration Using visible light

For mild-to-moderate inflammatory acne, they are recommended. When acne bacteria are exposed to 405–420 nm UV free blue light, both in vitro and in vivo, the bacterium's natural porphyrin production is affected, resulting in photo-destruction (26).

### Erythromycin

The therapeutic effect of oral erythromycin on acne is similar to that of tetracycline (27), even if erythromycin resistance in P. acnes appears to be more prevalent than tetracycline resistance (28) Erythromycin's most frequent side effect is gastrointestinal (GI) tract irritation, which can be somewhat reduced by taking the medication with food or milk (29,30).

Doxycycline, Minocycline, and Tetracycline For acne vulgaris, tetracycline and its derivatives are the most often prescribed

oral drugs. It is well known that tetracycline hydrochloride can pass through keratinocytes and sebocytes to enter the follicular canal (31).

Similar to topical medicines, tetracycline resistance in P acnes is a possible concern (31) and if a patient's acne gets worse after receiving treatment for a few months, this should be suspected. A lipophilic tetracycline derivative that has shown promise in treating inflammatory acne is doxycycline. Similar to tetracycline, P acnes resistance to doxycycline has also been documented (33). A lipophilic derivative of tetracycline as well, minocycline exhibits good follicular canal penetration and is frequently useful in treating acne that has not cleared up with other oral antibiotics (34).

### Isotretinoin

This vitamin A derivative is used to treat inflammatory and severe acne, which is frequently nodulocystic. Accutane, or isotretinoin, works against the four pathogenic elements that cause acne. It is the only drug that has the capacity to permanently suppress acne. The doctor needs to be registered in the manufacturer's

System to Manage Accutane- Related Teratogenicity (SMART) program in order to prescribe this drug. The U.S. Food and Drug Administration (FDA) and the SMART program were partnered to reduce unintended pregnancies and inform patients about the potential for severe side effects and teratogenicity from isotretinoin, a pregnancy category X medication (35).

### Types of acne lesions

There are other varieties of acne that can be identified, such as acne conglobate, acne rosacea, acne fulminans, acne excoriee (also known as picker's acne), acne medicamentosa, acne chloracne, and acne mechanical (36,37).

**Blackheads** developed on the skin as a result of dead skin cells and excess oil clogging hair shafts, blackheads are non-inflammatory acne lesions. The reason a blackhead is called an open comedo because the skin's surface is still visible and appears dark, like black or brown.

Mild acne known as "blackheads" typically affects the face, arms, chest, neck, back, and shoulders and is shown in Figure 2:



Figure 2: Black heads

**Whiteheads:** When oil, germs, and skin cells clog the pores of hair follicles, tiny pimples known as "whiteheads"—a non-inflammatory type of acne lesion—appear

on the skin. Because the bumps on a whitehead are closed and white, they are known as closed comedones. Although whiteheads can appear anywhere on the

body, the nose, chin, and forehead are the Tzone where they are most common to appear.

**Papules:** Inflammation, which manifests as swelling, heat, redness, and discomfort, is the body's reaction to germs, excessive oil production, and increased androgen activity. Known as papules, these inflammatory lesions are thought to constitute a transitional stage between non-inflammatory and inflammatory lesions.

**Pustules:** Caused by an accumulation of dead skin cells and excess oil in the pores, pustules are inflammatory lesions that appear on the skin as little bumps. Inflammatory lesions with pus or fluid in the center are called pustules. They frequently appear as white pimples encircled by red, inflamed skin. Although they can appear anywhere on the body, pustules are most commonly found on the hairline, shoulders, chest, back, face, neck, underarms, and pubic area.

**Nodules:** When bacteria, extra oil, and dead skin cells clog pores, the result is severe inflammatory acne known as acne nodules. This kind of mixture typically results in blackhead or whitehead comedones, but if the infection goes beyond the skin's surface and affects the pores, the surrounding area can also become swollen and red, giving the appearance of a little bump. Acne nodules can last for weeks or months and cannot be resolved with over-the-counter drugs alone. Similar to papule acne, nodular acne has a diameter more than 5–10 mm and frequently appears on the cheeks or jawline of the face.

**Cysts:** A severe form of inflammatory acne, cystic acne develops beneath the skin as a result of clogged pores brought on by the buildup of oil, dry skin cells, and germs (38, 39).

Treatment methods of acne are given in Table 1.

**Table 1: Treatment methods of Acne**

| Treatment Methods                       | Examples  |
|---|---|
| Topical                                 | Adapalene, isotretinoin, tretinoin, retinoyl-β-glucuronide, tazarotene, and tretinoin are examples of retinoids.<br>Antibiotics: erythromycin and clindamycin<br>Various: triclosan, niacinamide, salicylic acid, sodium sulfacetamide, chemical peels, corticosteroids, dapsone, hydrogen peroxide, azelaic acid, and sulfur.  |
| Systemic                                | Isotretinoin is a retinoid.<br>Antibiotics: levofloxacin, lymecycline, minocycline, roxithromycin, clindamycin, cotrimoxazole, doxycycline, erythromycin, and levofloxacin<br>Hormonal: birth control<br>Various: zinc sulfate, ibuprofen, corticosteroids, and clofazimine.  |
| Complementary and Alternative Medicines | Achillea millefolium, amaranth, antimicrobial peptides, arnica, asparagus, basil oil, bay, benzoin, birch, bittersweet nightshade, black cumin, black walnut, borage, burdock root, calendula, celandine, chamomile, chaste tree, Commiphora mukul, copaiba oil, coriander, cucumber, duckweed, Du Zhong extract, English walnut, Eucalyptus dives, fresh lemon, garlic, geranium, grapefruit seeds, green tea, jojoba oil, juniper twig, labrador tea, lemon grass, lemon, minerals, neem, oak bark, onion, orange peel, orange, Rose myrtle, rhubarb, Rosa damascena, rosemary, rue, safflower oil, sandalwood, seaweed, soapwort, Sophora flavescens, probiotics, pumpkin, resveratrol, stinging nettle, sunflower oil, Taraxacum officinale, taurine bromamine, tea tree oil, thyme, turmeric, vinegar, vitex, witch hazel, Withania somnifera, and yerba mate extract from Oregon grape root |
| Physical Treatment                      | Cryoslush therapy, cryotherapy, electrocauterization, intralesional corticosteroids, comedone extraction, and optical therapies (40)  |



### **Over the counter therapy: -**

Patients usually try over-the-counter treatments for their acne before visiting a doctor. These therapies could be less costly, more aesthetically pleasing, more widely available, and less annoying than prescription medications (41).

Compared to most prescription-strength medications, benzoyl peroxide is present in the most widely used over-the-counter products, such Proactiv, but in less amounts. Benzoyl peroxide 2.5%, the active ingredient in the Proactiv system of cleansing products, is said to improve compliance by offering an aesthetically pleasing product that also reduces irritation. The makers of Proactiv also sell Gentle Formula, which is intended for individuals with allergies or intolerances and uses salicylic acid in place of benzoyl peroxide. Few research have evaluated the Proactiv system's effectiveness. In one open-label research, patients with inflammatory lesions reduced by 39% when using a combination of benzoyl peroxide and butenifine (an allylamine), compared to 34% when using Proactiv. The study included 23 patients with mild to moderate acne (42).

When it comes to treating acne, a 2% salicylic acid wash is less powerful but still rather effective than a topical retinoid. Despite being in use for a long time, there aren't many well-designed studies examining its effectiveness and safety. Additionally, there is either little or no evidence to support the topical application of sulfur, aluminium chloride, zinc, and resorcinol.

There is insufficient data to conclude that frequent face washing reduces acne or that inadequate hygiene is a cause of acne vulgaris. Patients should be advised to wash their faces twice a day with warm water and a light soap; vigorous scrubbing might result in the rupture of follicles, which can lead to new lesions. Only benzoyl peroxide-containing antibacterial soaps have the potential to be successful (43).

9.4% of people worldwide are expected to suffer from acne, making it the ninth most

common skin condition. Over 85% of teenagers have acne, which can linger into adulthood. Females are more likely to have acne than boys, and two thirds of dermatologist visits for acne are related to acne (44). Acnes are usually found on the chest, upper back, neck, and face. Numerous types of acne exist, including acne that is caused by medicines (e.g., anabolic steroids, corticosteroids, isoniazid, lithium, and phenytoin), acne that is caused by the workplace, acne conglobata, acne fulminans, acne mechanica, excoriated acne, and chloracne. In terms of clinical and histological characteristics, these variants are similar to acne vulgaris; nevertheless, their severity and concomitant symptoms can help differentiate them (45).

### **Current developments and commercial goods:**

Inhibiting the mechanistic route or process involved in acne production is one of the new research and development opportunities that have been made possible by recent scientific improvements in our understanding of the complexity of acne. Recent researches have focused on controlling these pathways by targeting receptors, cytokines, chemokines, and other proinflammatory mediators. Furthermore, follicle-dwelling bacteria, the patient's genetic makeup, the skin microbiome, and therapeutic components of diet all play a significant role in acne therapy (46).

One of the novel approaches to acne therapy that shows promise is the use of medications that emit nitric oxide (NO). Among its many uses are strong anti-inflammatory, antibacterial, and antioxidant properties (47).

A strong vitamin A derivative called isotretinoin (ISO) is used to treat acne. It may result in an acne outbreak that clears up permanently. On the other hand, teratogenicity, skin, ophthalmic, and blood indicator alterations, as well as sporadic acne fulminans, are known side effects. It is crucial to concentrate on reducing these adverse effects by thinking about using

combination medications and changing the dosage. This will enhance the way that patients receive care (48).

Novel drug delivery technologies, such as liposomes, aerosol foams, nano emulsions, microsphere/spheres, and aerosols, have been the focus of formulation technology. Topical tretinoin and BPO microsphere formulations that are presently available on the market have shown satisfactory tolerance and efficacy. While microsphere encapsulation allows for the regulated release of potentially irritating medications, it also prevents the quick delivery of high concentrations of active drug to the application site. In the presence of UV or fluorescent light, it renders tretinoin photostable. Additionally, the encapsulation makes it possible to use easy topical combination regimens with potent oxidizing agents like BPO, which improves therapy outcomes and reduces discomfort (49).

#### **Comprehensive care:**

Since the microcomedo is essential for the development of both inflammatory and non-inflammatory lesions, topical retinoids need to be the first line of treatment for acne. When acne sufferers do not respond to topical treatments, if the acne manifests as nodules on the skin, or if there are scars, oral systemic therapy is recommended. Patients with acne must have systemic treatment in order to avoid psychological and social embarrassment. For treating acne vulgaris, the most often used systemic treatments include oral antibiotics, hormonal medications, and isotretinoin (50).

Comedones are well-known to respond well to glycolic acid peels. Its usage in inflammatory acne is also explained by recent evidence from an in vitro investigation that showed its moderate growth inhibitory and bactericidal effects on *P. acnes* (51). Antibiotics Taken Orally are The main issue with oral antibiotic therapy for acne is its unintentional correlation with the emergence of antibiotic resistance in bacteria other than *P. acnes* in the general population. By avoiding the simultaneous

use of topical and systemic antimicrobials, combining antibiotic monotherapy with BPO or retinoids to take advantage of their beneficial synergistic characteristics, and restricting the therapy to the shortest possible duration, prescribers can modify their practice to reduce future hazards (52).

Although minocycline works well for treating moderately to severely severe inflammatory acne vulgaris, there is currently insufficient data to support its use as a first line treatment. The main causes of this are its unclear safety profile and lack of benefits over other tetracyclines, such as lymecycline, doxycycline, and first-generation cyclines. Additionally, there is little evidence to suggest that the more costly extended-release formulation of minocycline is safer than regular formulations (53).

Another drug in the tetracycline family is memecycline; it is just as effective as minocycline but has a little lower risk of side effects and is far more affordable. A multicenter, randomized, double-blind controlled research showed that, in patients with moderate to severe acne vulgaris, oral lymecycline 300 mg plus adapalene 0.1%–BPO 2.5% fixed-dose gel was clinically superior to the oral antibiotic taken alone (54).

Hyaluronic acid fillers have been injected under the skin that has been subcised in conjunction with subcision to maintain optimal wound healing (55).

**Alternative methods** Despite the lack of evidence supporting their effectiveness, complementary and alternative medicines are frequently used to treat dermatological problems, particularly acne. The majority of the botanical acne products were found to have poor quality evidence in a recent systematic review, with the exception of a few studies that supported the topical use of tea-tree oil 5% gel and gluconolactone (obtained from *Saccharomyces bulderi*) in mild to moderate disease; the latter was found to be comparable with BPO 5% (56).

## CONCLUSION

Consensus recommendations for acne therapy have been attempted, including input from different sources and primarily based on evidence. Thanks to their ideas, a similar partnership was recently created in India as well.

Adult female acne patients have a wide range of treatment options at their disposal. Options for treatment should be customized for each patient, taking into account psychosocial aspects, the patient's preferences, and the agent's tolerance. When it comes to treating acne during pregnancy and nursing, there aren't many options. Nonetheless, there is little data to support the safety of any treatments during pregnancy or lactation. The development of new therapeutic medicines for AV sufferers will improve the treatment that clinicians provide to patients with this serious and common illness.

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