



(REVIEW ARTICLE)



## A comprehensive review of acne's facial impact and the therapeutic potential of Indian herbal medicine

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### Abstract

Acne vulgaris is a common dermatological disorder which mainly involves the face and results in physical as well psychological morbidity. In this review, we describe in detail the effects of acne on facial skin with a specific focus upon its etiologic agents and pathogenesis as well as emotional burden. The paper further delves into the potential of Indian traditional herbal formulations in managing acne, while highlighting some natural anti-inflammatory, antibacterial and antioxidant properties. The review bridges the gap between modern dermatological practices and ancient Ayurveda remedies highlighting prospect of herbs as an alternative systemic approach for acne management to gain clean skin health.

**Keywords:** Acne vulgaris; Facial acne; Indian traditional herbal medicines; Ayurveda; skin inflammation; Propionibacterium acnes; Natural remedies; Turmeric; neem; Aloe vera; tulsi; Manjistha; Acne treatment

### 1. Introduction

Acne vulgaris, or colloquially acne is one of the most common dermatological afflictions and impacts 85% teenagers along with quite a high number of adults also. Acne is commented to exist in the nonnormative folds of flesh and which was here as all over, on my torso, a shoulder upon another like so much sprawl lowing turmostretching into geometry but acne however appears even more visibly marked upon our faces 3and this location stamps its leadership by good measure. Acne, the most common skin disorder in adolescents and young adults is a broad term for disorders that influence hair follicles containing sebaceous glands within the pilosebaceous unit of face chest and back characterized by comedones (blackheads & whiteheads), papules, pustules to nodulocystic acne with possible scarring reaction. The pathogenesis of Acne largely centres around hyperseborrhea accompanying altered keratinization, colonizing microflora bc Propionibacterium acnes amongst others leading to inflammation.

Facial acne can also lead to strong emotional and psychological distress outside of that which you see on the surface of your skin. Alcoholism, low self-esteem and depression are more common among the people with acne due to visible skin imperfections carrying a social stigma. Scarring and hyperpigmentation also result from the condition, which can contribute to long-term dissatisfaction with the way they look.

Conceptual acne treatments involve using oral and topical medications such benzyol peroxide, retinoids, or antibiotics; however one should be wary of their disadvantages. These treatments may have potential side effects, degrade antibiotics resistant and cause skin irritation. These worries have led to an increasing interest in alternative and complementary therapies, especially drawing upon traditional medicine.

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The Indian traditional herbal medicine, especially Ayurveda derives from a historical tradition of thousands of years provides an abundant source for such natural remedies which have effectively being used to treat various types acne and other skin conditions since ancient times. These herbs have become popular for their minimal side effects, affordability and effectiveness in a way that will not harm you later. Neem (*Azadirachta indica*), Turmeric (*Curcuma longa*), Aloe vera (*Aloe barbadensis miller*) tulsi (*Ocimum sanctum*) Are the key herbs used in acne treatment. Also manjistha (*Rubia cordifolia*). They possess Anti-bacterial, Anti-inflammatory and Antioxidant properties And they are able to regulate hormonal imbalances very successfully, thus addressing the cause of most acne.

Here in this review, an attempt is made to provide a thorough insight into the insights of facial acne as well address how Indian traditional herbal medicines could be used for treating these conditions. This paper intends to provide a holistic perspective on acne treatment by outlining the pathophysiology of acne, discussing traditional wisdom herbs with identified antiacne activities and contemporary discoveries that have hinted at their therapeutic virtues.

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## 2. Causes and Pathophysiology of Acne

Acne vulgaris is a multi-causal skin disorder and most commonly appears in pilosebaceous units, hair follicles with attached sebaceous (oil) glands. This is because the process of acne development involves a complex interplay of events that are affected by hormonal changes, microbial activity inflammatory and genetic factors. Background The basic knowledge of the aetio-pathogenesis are important for successful management and treatment in acne.

### 2.1. Hormonal Factors

The development and progression of acne are mainly due to the production activities (estrogen, testosterone) that take place during puberty as well in menstruation or pregnancy. In particular, androgens — a group of hormones that includes testosterone. Androgens cause the sebaceous glands to produce more oil when they rise in adolescence. When sebum is produced in excess it causes the hair follicles to become blocked with oil and this environment will help create comedones (blackheads/whiteheads) as well acne lesions.

Acne can also become more severe due to hormonal imbalances from the menstrual cycle, polycystic ovary syndrome (PCOS) and pregnancy in women. At those times, the sebum production and follicular hyperkeratinization already in progress often worsen due to potentiation by rising androgen levels.

### 2.2. Microbial Factors

There is a good reconciliation score with *P. acnes* which has been recently renamed to *Cutibacterium acnes* and plays an important role in the progression of acne issues. *P. acnes* is a nonmotile, aerotolerant anaerobic microorganism which can be found in the hair follicles and sebaceous glands of human skin where conditions are generally but not completely anoxic. When it mixes with these sebum and dead skin cells, all of which are trapped inside clogged hair follicles—cystic pimples grow.

This increased sebum production then promotes an anaerobic (low oxygen) environment, the ideal conditions for *P. acnes* growth. Those triglycerides are metabolized by the bacteria into free fatty acids, which cause skin irritation and hence inflammation. Furthermore, activation of toll-like receptors (TLRs) on keratinocytes and immune cells by *P. acnes* induces the expression of pro-inflammatory cytokines and chemokines that promote inflammation.

### 2.3. Inflammation

Inflammation is a key element in the acne pathophysiology. It starts when sebum and keratinocytes collect within the hair follicle to form a microcomedo. The follicular wall may rupture and its contents are spilled into the surrounding dermis as a result of distention. This event incites a local inflammatory response that is characterized by the arrival of neutrophils, macrophages and lymphocytes which aid in establishing papules, pustules (pimples), nodulocystic acne.

Together with its release of inflammatory mediators, IL-1, TNF- $\alpha$  and MMPs further amplify the inflammation. These mediators encourage inflammatory damage and can also lead to scarring due to the inevitable tissue destruction with it, secondary hyperpigmentation.

### 2.4. Follicular hyperkeratinization, a term coined in the 1950s

The term follicular hyperkeratinization represents the increase in shedding of keratinocytes (skin cells) within the hair bulb resulting with obstruction overlying to a normal appearing opening. This leads to a clogging and build up of sebum, which then triggers the formation of microcomedo (the beginning phase from all forms of acne lesions)

It is minor process which appears to be induced by many factors such as androgens, inflammatory mediators & local cytokins. Excessive keratin production and improper desquamation of the follicle cells result in a plug that blocks the pore, muffling sebum and bacteria inside.

## 2.5. Genetic Predisposition

Acne growth is also highly affected by genetic factors. People with a case of acne in the family are more susceptible to it. A number of factors regarding the pathophysiology of acne are under genetic control, such as sebaceous gland activity, androgen sensitivity, immune response or follicular hyperkeratinization.

Genic Studies on acne have showed that the concordance of acne severity is higher in monozygotic twins than dizygotic types, confirmed by various other methodological designs. Differences in genes connected with inflammation, sebum production and even skin barrier function - things known to contribute an individual's likelihood for getting acne.

## 2.6. Exposures to Lifestyle and Environment

Aside from the already discussed biological causes of acne, external environmental and lifestyle factors can contribute to making acne sure worse. Several factors such as diet, stress, exposure to environmental pollutants and use of certain skincare products can contribute towards causing acne. For instance, a high sugar and dairy diet may raise insulin levels- as such increasing the production of androgens causing overproduction of sebum. Stress also works to worsen acne by raising cortisol levels that promotes sebaceous gland activity.

## 2.7. Impact of Acne on Facial Skin

Acne vulgaris, especially when of the facial type has devastating consequences that go way beyond mere physical appearance. Facial acne affects the skin physically in one of two ways and yields mental effects abundantly. This information is essential to be able to have a complete formation for the treatment and also the control of acne.

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## 3. Effect on Facial Skin

### 3.1. Lesion Formation

Types of lesions that characterize facial acne are comedones (blackheads and whiteheads), pustules, papules, nodules and cyst. This results to the clogging of hair follicles by sebum, dead cells and growth inhibition on acne bacteria known as Propionibacterium acnes. Acne severity differs from person to person, and ranges from mild forms such as comedones (blackheads) through strolling for severe nodulocystic acne.

Comedones: Non-inflammatory lesions caused by overproduction of oil that may be blackheads (open comedones) or white heads.

Papules and Pustules: Their appearance is of a small, red papule or pimple filled with pus.

Nodules and Cysts: Severe, painful bumps that are deep within the skin. Body damage can produce significant scarring.

### 3.2. Causes Scarring and Post-Inflammatory Hyperpigmentation (PIH)

Scarring is one of the most traumatic physical consequences caused by acne on face. After the process of irritation, arising due to inflamed acne lesions, the body's natural response is forming acne scars. Type and how much the scar will be pronounced depends on how severe the inflammation is, as well as your skin's healing response. Acne scars come in all shapes and sizes but let's categorize them into 3 most common types:

Atrophic Scars – these are depressed scars caused by collagen destruction that takes place during wound healing. These can be divided into ice pick scars, boxcar scars and rolling scar which all have different qualities.

Hypertrophic Scars & Keloids: Raised scars caused by an over-production of collagen. Keloids grow beyond the margins of normal skin damage due to acne.

Another common complication of facial acne is post-inflammatory hyperpigmentation (PIH). Post-Inflammatory Pigmentation (PIH) is what happens when the skin produces an abundance of melanin in response to inflammation,

causing dark spots or patches. While not a traditional scar, PIH can last for months — even years and is often the biggest culprit when it comes to changing someone's complexion and skin texture.

### **3.3. Loss of Smooth Skin Texture and Even Tone**

You might have an uneven skin texture and tone due to chronic acne. The continuous process of lesion development, inflammation and healing can eventually cause the skin to lose its natural marginally level surface; as it will be left with fringe patterns more pores (fewer pores in many places) cropped up patches flush. Secondly, when PIH and/or erythema (redness) coexist, the skin tone can be patchy or speckled in appearance which gives a less even complexion.

### **3.4. Psychological Impact**

Acne is not skin deep, it goes beyond bearing keys of feelings and Psychology. One of the ways they do so is by causing acne on our faces which then brings with it a whole host of issues from negative emotions to mental health.

### **3.5. Self-Esteem and Body Image Problems**

Facial acne causes dissatisfaction in looks, which can be responsible for low self-esteem and body image problems. The feeling of self-conscious can come from the constant visibility of acne lesions and foster a negative self-perception. Nowhere is this more important than for our adolescents and young adults who are at a vulnerable phase in their own identity development as well as social maturity.

### **3.6. Social Anxiety and Withdrawal**

Pride Body — The feeling of shame in having a face full for acne | War Against Acne These people might experience social stigmatization with facial acne essentially shunning them from society and relationships, and even towards life! This social withdrawal can add to feelings of loneliness and reclusiveness.

### **3.7. Valley Forge Geology, Depression and Sorrow**

Severe acne has been linked to depression in several studies. Chronicity along with the impact in appearance and social life of acne results into substantial emotional distress. People can even become clinically depressed with a pervasive sense of sorrow, loss (of interest in activities), and hopelessness.

### **3.8. Impact on Quality of Life**

Where low self-esteem, social anxiety and emotional distress all converge over time to chip away at your quality of life. Even just going to school or work, partaking in a hobby, and interacting with other people can be tougher. The psychological consequences due to acne can also affect academic and professional performance, subsequently increasing the percentage of entire bad impacts on one's life.

### **3.9. Indian Traditional Herbal Medicines for Acne Treatment**

In fact, the ancient Indian traditional medicine —Ayurveda offers a n number of herbal remedies that are used since centuries to treat different skin ailments and this includes acne as well. Being natural avoid and minor/mild side effects, it's getting popular as quantity method of Acne treatment/solution over time due to conventional medicinal cure. This article will highlight the important Indian herbal medicines that are commonly used for the treatment of acne vulgaris, with their therapeutic properties and mechanism(s) of action along with reported anti-acne potentials.

### **3.10. Neem (Azadirachta indica)**

One of the most sacred trees in India, Neem, or "Miracle Tree," is a useful herb for diabetes. Since it is having antibacterial, antifungal and anti-inflammatory properties thus it has been used for the treatment of acne.

**Antibacterial and Antifungal Properties:** Neem contains nimbidin, which has strong antibacterial effects against *Propionibacterium acnes*; the bacterium responsible for acne. These compounds work by reducing skin bacterial burden which consequently prevents the development of new acne lesions.

**Anti-Inflammatory Effects:** The anti-inflammatory properties of Neem aid in reducing the redness, swelling and pain caused by acne. Preventing pro-inflammatory cytokines to more peaceful irritated and improved healing properties come from the neem layer.

Application: You can apply neem over your skin as a paste of the leaves or/and by using some pure neem oil. It is also included in acne-centric skincare products like face washes and creams.

### **3.11. Turmeric (*Curcuma longa*)**

Turmeric is a very popular herb in Indian traditional medicine, it has some of the greatest anti-inflammatory and antioxidant properties. Especially when it comes to acne remedy, turmeric is one of the best and curcumin as an active compound in turmeric works at its very best.

Anti-Inflammatory and Antioxidant properties: Curcumin inhibits pathways of inflammation, reduces production of inflammatory cytokines that causes acne lesions. Polygonum Aviculare helps in neutralizing free radicals that are associated with skin damage and aging.

Antibacterial Effects: Another reason turmeric is good for skin care is because it helps in controlling the growth of acne-causing bacteria that are present on your skin.

Mask: By mixing Turmeric powder with honey or yogurt, it can be used as a mask. It also comes as creams, soaps or lotions for acne treatment.

### **3.12. Aloe Vera (*A. barbadensis miller*)**

One such plant is the aloe vera, known for its history in treating acne and other skin conditions. It is as known for its calming, hydrating and also recovery homes.

Soothes the Skin and Has Anti-Inflammatory Properties : Aloe has gibberellins and polysaccharides which are anti-inflammatory compounds that reduce swelling redness, written on pure natural science It even gives a cooling effect which calms the skin irritation.

How Aloe Vera Helps For Acne Scars Healing and Scar Prevention :-It help in promoting wound healing and skin regeneration which is useful for scar prevention and decreasing of acne scars. Aloe has a relatively high water content and will help keep your skin hydrated without blocking pores.

Application: Aloe vera gel may be applied fresh from the plant, or used in gels, creams and cleansers

### **3.13. Tulsi (*Ocimum sanctum*)**

Tulsi (Holy basil) is considered a holy plant in India and has been widely used for its purifying and detox functions in Ayurvedic medicine.

Antibacterial and Antimicrobial Properties: The eugenol, an essential oil of tulsi has potential to inhibit the growth of acne-causing bacteria. It has an antimicrobial effect and helps prevent skin infections.

Acts as a Detoxifier: Tulsi is well-known for its detoxifying and purifying effects which helps in blood purification thus preventing breakouts. It assists in hormone balance and decrease over-production of sebum.

Uses: You can grind fresh tulsi leaves and apply that as a face mask or use topical application of tulsi oil. It works well in acne fighting product extracts of Tulsi are often available.

### **3.14. Manjistha (*Rubia cordifolia*)**

Manjistha is not known as much but in Ayurveda, its efficacy against skin problems has been proven. Has blood purifying and anti-inflammatory properties.

Purifies Blood: Manjistha has blood purifying properties which is important for healthy and acne free skin. It helps in cleansing the blood so it lessens toxic acne breakout from while needs way to kill an internal toxins by purifying constituents of the system.

Anti-Inflammatory Effects: Manjistha plays an important role in calming inflammation, constraining it for healing acne lesions. It is also useful to treat PIH (post-inflammatory hyperpigmentation), brightening the skin.

Application: This herb can be taken internally as capsules or powder, and it is also often made into a simple paste using the powdered periwinkle mixed with water or some natural ingredients for external application.

### 3.15. Other Herbal Remedies

Sandalwood (*Santalum album*): Sandalwood cools the skin and is an anti-inflammatory that can reduce inflammation in acne-causing breakouts to help smooth out scars.

Lodhra (*Symplocos racemosa*): As a potent sebum production control agent, it can inhibit pore-clogging and thus prevents acne.

Licorice Root (*Glycyrrhiza glabra*): Licorice root has anti-inflammatory and skin-lightening properties, making it a good treatment for acne-prone faces that need to fade post-acne hyperpigmentation.

### 3.16. Mechanisms of Action of Herbal Medicines

Most of the Indian traditional herbal medicines used for treating acne have rich bioactive compounds and also provide much help in getting rid of it. The constituents of these herbs have different mechanisms that target the phases of acne pathophysiology such as microorganisms growth, inflammation, sebum production and skin healing. This section examines the root mechanisms of different herbs used in acne treatments.

### 3.17. Antibacterial Action

One of the key factors that causing acne is bacterial overgrowth to *Propionibacterium acnes* (now *Cutibacterium acnes*), a bacterium that grows inside hair follicles. A wide number of Indian herbs possess potent antibacterial effects on this pathogen – which inhibit the growth and proliferation.

Neem (*Azadirachta indica*): Various biological activities like antibacterial due to contain nimbidin, nimbin and azadirachtin. These agents alter and disrupt the bacterial cell wall, impairing enzyme function required for bacteria to survive; hence minimizing microbiota on skin mediated prevention of acne lesions.

Turmeric (*Curcuma longa*): Curcumin, the active ingredient in turmeric has been proven to suppress *P. acnes* as curcumin can effect bacterial cell membrane integrity and inhibit bacterial enzymes. It also has broad-spectrum antimicrobial activity, thereby reducing the risk of secondary infections.

### 3.18. Anti-Inflammatory Effects

Inflammation also plays an important role in the formation of acne lesions. The herbs provided in this program, as well anti-inflammatory effects that reduce redness and swelling is believed to be the benefits of reducing acne pain.

Aloe Vera (*Aloe barbadensis miller*): The anti-inflammatory effect of aloe vera is mainly due to polysaccharides, gibberellins and other compounds. This helps stop the development of pro-inflammatory cytokines like interleukin-1 (IL-1) and tumor necrosis factor-alpha (TNF- $\alpha$ ), that play a role in acne inflammation. Aloe vera reduces inflammation and soothes the skin in acne lesions.

Tulsi (*Ocimum sanctum*): Tulsi eugenol and several other bioactive compounds possess anti-inflammatory activity. These compounds inhibit the activity of cyclooxygenase (COX) enzymes and reduce pro-inflammatory mediators production, benefiting in treating acne.

### 3.19. Antioxidant Activity

Acne formation and skin damage can also result from oxidative stress, which is the imbalance between free radicals and antioxidants. Antioxidant-rich herbal medicines help to combat free-radical damage that slight oxidative cell injury and wound healing.

Turmeric (*Curcuma longa*) Curcumin is an antioxidant that scavenges free radicals to reduce oxidative stress in the skin. Curcumin protects the skin from free radicals preventing acne lesions and support in repair.

Manjistha (*Rubia cordifolia*): Manjistha is another natural blood purifier, which contains flavonoids, anthraquinones and other antioxidants that protect the skin from oxidative damage. These ingredients help the skin in its natural recovery process and also prevent acne scars and post-inflammatory hyperpigmentation.

### 3.20. Sebum Regulation

Overproduction of sebum is also one of the keys to acne formation. Certain herbal medicines can help control the production of sebum, which may reduce your risk for clogged pores and acne.

Lodhra (*Symplocos racemosa*): One of the key wonders of Lodhra is its ability to control sebum secretion by acting on sebaceous glands in keeping them regulated. Lodhra regulates the secretion of oil on our skin and prevents pore clogging that leads to comedones.

Tulsi (*Ocimum sanctum*): Ritual performed with tulsi helps in maintaining hormonal balance responsible for sebum generation. Tulsi reduces the excessive production of sebum which results in making your skin less oily and thus reduced possibility for acne formation.

### 3.21. Skin Healing and Regeneration

Herbal medicines are also important in maintaining the health and vitality of acne affected skin. These herbs are used for wound healing, help eliminate scars and nourish the skin.

Aloe Vera (*Aloe barbadensis miller*): This plant encourages skin healing by virtue of its growth hormone gibberellins and polysaccharides that boost fibroblast activity stimulating collagen production. That is good for repairing skin with scars and bad for smoothing the surface.

Sandalwood (*Santalum album*): Widely known as an anti-inflammatory, sandalwood is a great ingredient to help soothe inflamed skin. This soothes irritation and cools skin, which helps to calm redness and inflammation as well kill acne-causing bacteria. Simultaneously, it has regenerative components allowing non inflamed-congested tissue to start the healing process by targeting cells damaged from a breakout adjusting pigmentation while eventually fading post-inflammatory hyperpigmentation grounds given time twice per week use at night throughout weeks 15-20 or indefinitely when using tons of mattifying make-up sunscreen daily too often just keeping "under control" without irritating them all over again so soon after being cleared and decreases oil production is sometimes observed in some individuals via increased sebum suppression resulting into decreased frequency/pressure rather excellent sign alongside quicker turnover if mixed evenly encompassing various long-term benefits including smooth consistency (face released more with better texture).

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## 4. Blood Detox/ Blood Purification

As per Ayurveda, the purity of blood has a direct relation with its texture. In traditional Indian medicine several herbs are believed to act as blood purifiers and detoxify the body so that acne development is checked.

Manjistha (*Rubia cordifolia*) Known for its blood purifying actions, Manjistha works to remove deep-rooted impurities from the tissues and helps unblock/unplug them. These help in detoxification of blood and flushing toxins out that may lead to skin issues like acne. By cleansing blood and eliminating impurities, manjistha offers a natural way to get clearer skin.

Azadirachta indica (Neem): Blood purifier; removes toxins from the body which can be a causative factor for formation of acne. This inner detoxification sustains total skin wellness as well as helps with getting rid of coming back acne episodes

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## 5. Conclusion

Acne vulgaris is still a universal problem that has been known for years as one of the cutaneous conditions which can have an adverse effect on patients' personal aspect and peace, above all when facial involvement. Here we review the complex ways in which acne affects facial skin, from lesion production to scarring and disruption of coloration. Furthermore, the vast array of psychological ramifications accompanying gynecomastia, namely self-esteem issues; social anxieties and depression further tell us that we need to be attacking from all angles.

Indian traditional herbal medicines offer a supplementary and/or alternative product to conventional acne therapies. Herbs such as neem, turmeric and aloe vera amongst others are endowed with antibacterial, anti-inflammatory antioxidant properties enabling topical use for treating acne. These treatments target on several steps in the pathogenesis of acne from control over microbes, abrogating inflammation to reparation and detoxification of skin.

As the above mentioned drugs, these mechanism of action can be used to fight with acne too. A combination of neem's antibacterial and anti-inflammatory properties, turmeric's antioxidant benefits and antimicrobial effects, aloe vera calming traits with tissue healing ability, tulsi action in sebum regulation and detoxification actions as well as manjistha blood purifying activity.

This approach of combining the wisdom from ancient Indian herbal remedies with modern acne management protocols seems to have been providing a more holistic solution which is in-line with natural and preventive healthcare. In summary, integrating traditional herbal knowledge with modern medical techniques may be the key to deliver better acne therapeutics that are not only effective and safe but also provide comprehensive therapeutic options for patients.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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