

## **Pharmacological Strategies Used in Treatment of Skin Diseases**

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### **Abstract:**

Skin is the most exposed organ of the body, is an organ providing contact with the environment and protecting the human body from unfavourable external factors. Skin inflammation, reflected adversely in its functioning and appearance, also unfavourably affects the psyche, the condition of which is important during treatment of chronic skin diseases. Skin diseases are most common form of infections occurring in people of all ages. Skin diseases are seen worldwide and are thus a matter of serious concern. The prescribed synthetic drugs available in the market for the treatment of various skin diseases are associated with different adverse effects, so researchers around the world are searching for new, effective, and safer drugs from natural resources. Herbal medicinal plants are a very good source of active ingredients of medicine and provide a safer and cost-effective way to treatment of skin diseases. Virtually all human beings continue to rely on medicinal plants for skin diseases. The aim of this review paper is to discuss the beneficial effects of assured medicinal plants for wide awareness of their utility for the treatment of skin diseases.

**Key Words:** Skin diseases, medicinal plants, India, allopathic formulations, aloe vera

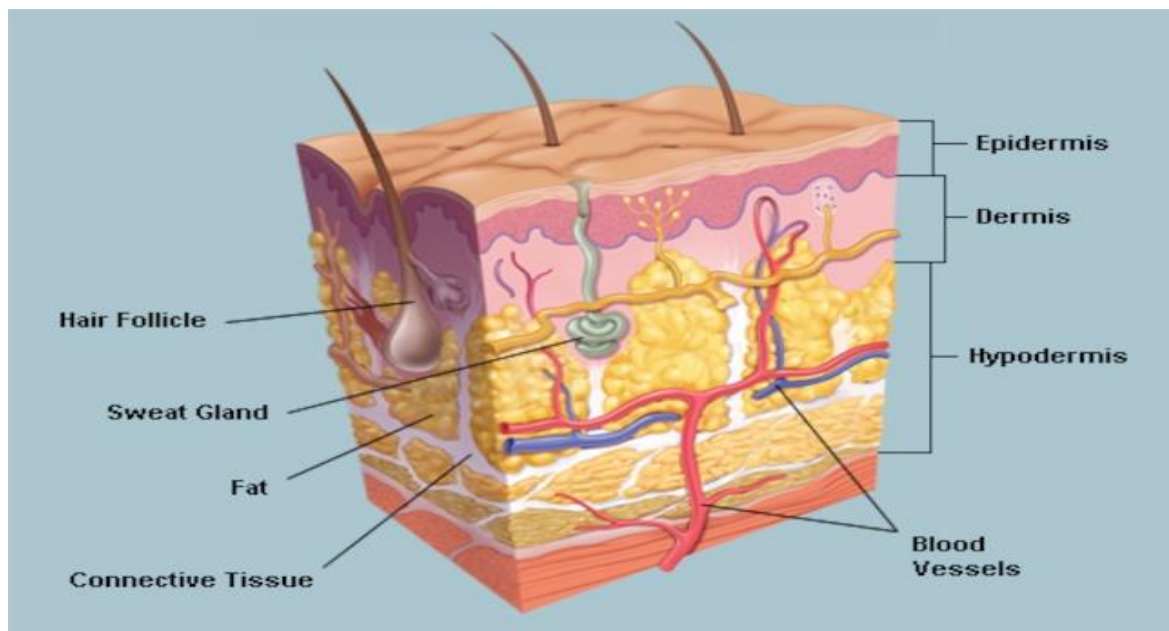
### **Introduction**

Human skin is the external covering of the body; skin is the biggest organ in the body. It additionally constitutes the primary line of barrier. Skin contains numerous specific cells and structures. It is isolated into 3 primary layers viz. epidermis, dermis and hypodermis (Thirumal, M. et al. 2012). Every layer gives an unmistakable part in the general capacity of the skin. Epidermis, the external most layer of the skin, changes in thickness in various districts of the body. It is the slenderest on the eyelids (0.05 mm) and the thickest on the palms and soles (1.5 mm). The dermis additionally fluctuates in thickness relying upon the area of the skin. It is 0.3 mm on the eyelid and 3.0 mm on the back of the body. The dermis is appended to a basic hypodermis or subcutaneous connective tissue (NNIS report, 2004). The subcutaneous tissue is a layer of fat and connective tissue that houses bigger veins and nerves. This layer is critical in the control of temperature of the skin itself and the body (Umadevi,

U., 2016). The measure of this layer differs all through the body and from individual to-individual. Hair follicles sweat organs and sebaceous organs are the primary skin member's (Figure 1). Skin health is fundamental to total health. Plants have traditionally served as man's most important weapon against pathogens (Teshome, D., 2015).

### **Functions of skin:**

1. Since it interfaces with the earth, skin assumes a key part in ensuring (the body) against pathogens and exorbitant water loss.
2. Its different capacities are protection, temperature direction, sensation, stockpiling and combination of vitamin D by activity of bright (UV) and the insurance of vitamin B folates, ingestion of oxygen and drugs and water resistance.
3. Severely harmed skin will attempt to recuperate by framing scar tissue. This is regularly stained and de-pigmented (Ryan, T.J., 2015).

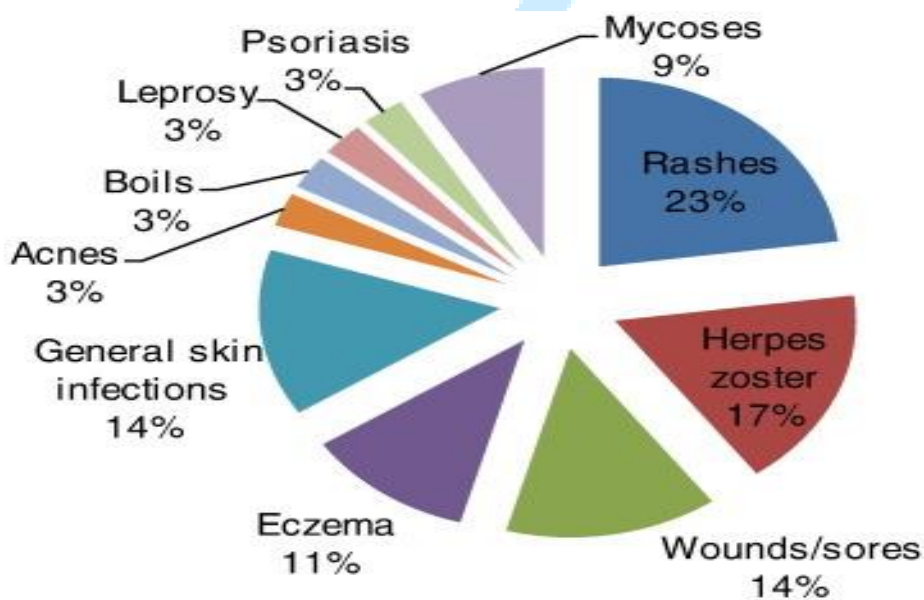


**Figure 1:** Skin layer

**Epidemiology of skin diseases:**

The severity of growing skin diseases in India is further emphasized by the fact that the World Health Organization has included skin disease under the most common non-communicable diseases in India. In 2013, with prevalence rate of 10 percent, the population affected across India from skin disease is estimated at nearly 15.1 crore. It is estimated that at a Compound Annual Growth Rate of 12 percent about 18.8 crore people is likely to suffer from skin

disease by 2015 (Figure 2). The emergence of cosmetic and anti-aging treatments has changed the face of the skin care industry. The number of these cosmetic procedures is expected reach 18-20 lakh by 2015 in India. During the past 5 years, there has been a considerable growth in the Indian cosmetic/aesthetic surgery industry. The demand is high in urban regions like Chandigarh, Mumbai, Delhi, Chennai, Kolkata, Hyderabad, Bangalore, and Pune.



**Figure 2:** Frequency of affected people of different skin diseases

**Common skin problems:**

Skin disease is a common ailment and it affects all ages from the neonate to the elderly and cause harm in number of ways (Luiz, R.R., 2018). There are more than a thousand conditions that may affect the

skin, but most skin diseases can be categorized into 8 common types:

**Acne:** Acne (pimples) is a common skin condition characterised by the presence of various spots called comedones (blackheads and whiteheads), papules, pustules, and, in severe cases, nodules and cysts

(Kirwan, L.A., 2018). The development of acne coincides with the onset of puberty when androgen hormones, such as testosterone, are released. These hormones can cause the sebaceous glands to over produce sebum (oil), which leads to blockage and the typical spots associated with acne. Even though many consider acne to be a normal part of growing up, it can have serious effects on a young person's academic performance and their ability to interact socially (Van Ratingen, A.R, 2016).

**Rashes:** A rash is an area of red, inflamed skin or a group of individual spots. These can be caused by irritation, allergy, infection, an underlying disease, as well as by structural defects for example, blocked pores or malfunctioning oil glands. Examples of rashes include acne, dermatitis, eczema, hives, pityriasis rosea and psoriasis (Elgendy, A., 2016).

**Atopic dermatitis (eczema):** Atopic dermatitis is an inflammatory skin condition which manifests as a red, scaly rash that is normally very itchy. It tends to be an inherited condition which runs in families along with asthma and hayfever. In general, it occurs first on the face in infants and then on the front of the elbows and behind the knees (the flexures) with increasing age (Chong, J.H., et al. 2016). It can occur on any part of the skin at some stage, depending on age and exposure to environmental irritants. For example, in mothers with young babies, or hairdressers, it may occur on the hands (Zaid, F.E., et al. 2016).

**Fungal infections:** Harmless fungi are always present on surface of the skin. Infection occurs when these organisms enter into the body. These infections are usually superficial, affecting the skin, hair, nails and include athlete's foot, lock itch and ringworm. However, in people with suppressed immune system or who have been taking antibiotics for long period - the fungi may spread to deep within the body, causing more serious disease (Greer, R.O., 2016).

**Psoriasis:** Psoriasis is inflammatory skin disease characterised by a red, scaly rash, which can be itchy. A typical lesion is a well-defined raised plaque with a silvery scale. It occurs classically on the elbows, knees and in the scalp, but can occur on any part of the body on occasion, including the flexures. It can cause the nails to become pitted, discoloured and fragile (Brassie, M., et al. 2016). While the cause of psoriasis is essentially unknown, it appears to be more common in some families. It has also been associated with various factors in those people who are predisposed to psoriasis, such as trauma to the skin, streptococcal upper respiratory infections,

stress, some medications, heavy alcohol intake and smoking (Aguirre, A., et al. 2018).

**Warts:** Warts are a viral infection of the skin caused by the Human Papilloma Virus. There are 2 types: common warts (*Verruca vulgaris*) and plantar warts (*verruca plantaris*). Common warts are flesh-coloured lesions occurring most frequently on the hands, fingers and knees. They can also grow at a site where an injury has occurred. They are not usually painful, although they may cause pain if they develop at a site where pressure occurs, e.g. knuckle or the knee. Plantar warts (also called papillomas) are flesh-coloured and are found on the sole of the foot. They are flat as the person's body weight forces them to grow inwards. This can be very painful (McDaniel, B., et al. 2018).

**Tinea pedis and Tinea unguium:** *Tinea* (also called ringworm) is an infection of the skin, nails or hair caused by dermatophyte fungi. Dermatophytes are grouped into three classes: *Trichophyton*, *Epidermophyton* and *Microsporum*. Each of these classes of fungi can infect the skin, but *Microsporum* tends not to involve the nails and *Epidermophyton* seldom invades hair. *Tinea* is also classified clinically based on what area is infected. 2 types of *tinea*: *tinea pedis* (tinea of the foot) and *tinea unguium* (tinea of the nail). *Tinea pedis* manifests as a red, scaly, rash on the foot which can be itchy on occasion. It commonly occurs between the toes, particularly between the 4th and 5th toes, but can occur anywhere on the foot (Anusha, S., et al. 2013). *Tinea unguium* (also called dermatophyte onychomycosis) manifests as discolouration of the nail plate and there may be a build-up of infectious material and cells under the nail plate. The nail plate may occasionally partially lift away from the nail bed. This condition is usually accompanied by *tinea pedis* (Chopade, V.V., et al. 2008).

**Tumours and cancers:** These growths arise when skin cells begin to multiply faster than normal. Not every skin growth is cancerous. Some tumors are harmless and will not spread. Skin cancer is the most common of all the cancers, affecting 8 lakh Americans each year. It is caused, in 90 percent of cases, by sun exposure. The 3 types of skin cancers are basal cell cancer (the most curable), squamous cell cancer (which may grow and spread) and malignant melanoma (the most deadly form). Prevention involves protecting the skin against damaging ultraviolet rays. Early detection helps to improve the chances of a cure. Regular self-examinations are, therefore, recommended (Joshi, A.R., et al. 2007).

**Other conditions:** Wrinkles, rosacea, spider veins and varicose veins are among those conditions that cannot be neatly categorized. Wrinkles are caused by a breakdown of the collagen and elastin within the dermis, which results in sagging skin. Rosacea is a chronic disorder in which the skin of the face becomes red and develops pimples, lesions and more rarely enlargement of the nose. Its cause is unknown. Spider veins and varicose veins become apparent when blood vessels enlarge and become visible through the surface of the skin (Arora, N., et al. 2011).

### **Allopathic Treatment of Skin Diseases:**

**Topical and oral therapies:** Topical therapies involve the application of a topical agent on affected sites of skin. Topical agents are compounds of a main agent and a vehicle (base) (Cibin, T.R., et al. 2012). The main agent acts on lesions, whereas the vehicle acts supplementary to increase absorption of the agent. The horny cell layer in the outer most layer of skin is water-repellent and dense. It prevents water from evaporating from the body, which means it is the strongest barrier for the topical agent to overcome (i.e., the rate-controlling step) (Egharevba, K.A., et al. 2008.). The water-repellent horny cell layer generally has a thin sebum membrane on the surface that also functions as a barrier. The site below the granular cell layer is characterized by hydrophilicity and ready absorption of agents.

**Ointments:** Ointments are the most frequently used topical agents. They are less stimulative than other vehicles and are highly protective. They are transparent or translucent semisolids.

**Oleaginous ointments:** Various oils such as olive oil, vaseline, paraffin, and plastibase are the most frequently used vehicles for oleaginous ointments. These ointments are free of water, absorb little water, and are insoluble in water. They are also called water-repellent ointments. The vehicle itself protects and softens the skin and works as an anti-inflammatory. Oleaginous ointments are the least stimulative, and are applied on all kinds of eruptions. (Examples: white petrolatum, zinc oxide ointment, various steroids) (Verma, S., 2016).

**Emulsified ointments:** These are water-in-oil ointments containing emulsifiers such as polyethylene glycol.

**Creams:** Creams, also called oil-in-water emulsive vehicles, are semi-solid mixtures of oil suspended in water containing emulsifiers. Creams are less sticky than ointments, and the colour disappears when they are applied thinly (vanishing cream).

**Lotions:** Lotions are liquids (usually water) with an agent mixed in. When applied topically, the liquid evaporates, bringing cooling, astringent and protective effects. The agent remaining on the skin acts pharmacologically.

**Tinctures:** Agents dissolved in alcohol or in alcohol and water, Aerosols: vaporized liquid agents.

**Powder:** The main ingredients of powders are zinc oxides, talc (magnesium silicate), and starches. Powders dry affected sites by absorbing moisture. They also cool the skin, reduce friction, and smooth the skin surface.

**Retinoid:** These medications (such as retin-A and tazorac) are gels or creams derived from vitamin A and are used to treat conditions including acne.

**Salicylic acid:** This medication is available in the form of lotions, gels, soaps, shampoos and patches. It should be used sparingly as putting too much on one's body at once can cause toxicity. Salicylic acid is the active ingredient in many skin care products for the treatment of acne and warts.

**Anthralin (drithocrema, micanol and others):** Although not often used, these help to reduce inflammation and can help treat psoriasis.

**Antifungal agents:** Lamisil, lotrimin and nizoral are few examples of common topical antifungal drugs used to treat skin conditions such as ringworm and athlete's foot.

**Benzoyl peroxide:** Creams and other products containing benzoyl peroxide are used to treat acne (De Wet, H., et al. 2013).

**Coal tar:** This topical treatment is available with and without a prescription, in strengths ranging from 0.5-5 percent. Coal tar is used to treat conditions including seborrheic dermatitis (usually in shampoos) or psoriasis. Currently, coal tar is seldom used because it can be slow acting and can cause severe staining of personal clothing and bedding.

**Corticosteroids:** These medications, including prednisone can be helpful in treating skin conditions linked to autoimmune diseases including vasculitis and inflammatory diseases such as eczema and psoriasis. Dermatologists prefer topical steroids to avoid side-effects; however, short-term use of prednisone is sometimes necessary. It is used to treat skin conditions including eczema and come in many forms including foams, lotions, ointments and creams.

**Antibacterial:** These medicines, like bactroban or cleocin, are often used to treat or prevent infection.

**Antiviral agents:** Common antiviral agents include valtrex, acyclovir and famavir. Antiviral treatments are used for skin conditions including those related to herpes.

**Antibiotics:** Oral antibiotics like erythromycin, tetracycline and dicloxacillin are used to treat many skin conditions.

**Immunosuppressant:** immunosuppressant, such as azathioprine and methotrexate, can be used to treat

conditions including severe cases of psoriasis and eczema.

**Biologics:** These new therapies are the latest methods being utilized to treat psoriasis and other conditions. Examples of biologics include enbrel, humira, remicade, stelara and ameveve (Lukambagire, A.H., 2018.).

Table 1: Some allopathic formulations are used in treatment of skin diseases

AGENT	FORMULATIONS	MECHANISM OF ACTION
<b>Amphotericin B</b>	Injection 10mg, 25mg, 50mg	Selective fungicide acts only against fungal sterol. Binds to ergosterol found in fungal membrane and alter permeability by forming amphotericin B-associated pores leakage of intracellular ions and macromolecules, cell death.
<b>Griseofulvin</b>	Tablet 250mg, 375mg	Inhibition of fungal cell mitosis
<b>Flucytosine (5-FC)</b>	Capsule 250mg, 500mg	Drug is taken up by fungal cells via cytosine permease and converted by cytosine deaminase to active metabolite 5-fluorouracil (5-FU). Fluorodeoxyuridine monophosphate (F-dUMP, thymidylate synthase inhibition, DNA synthesis inhibition) Fluorouridine triphosphate (FUTP, substitution for uracil, RNA and protein synthesis inhibition).
<b>Clotrimazole</b>	Tablet 100mg, Lotion, Cream, Gel 1%, Powder	Inhibition of ergosterol local irritation, allergic reactions not applicable to topical therapy (topical) synthesis leading to impaired fungal cell membrane integrity and activity
<b>Fluconazole</b>	Tablet 50mg, 150mg, 200mg	As above
<b>Terbinafine</b>	Tablet 250mg	Inhibition of squalene epoxidase; activity related in the most to the toxic effects of squalene accumulation
<b>Tolnaftate</b>	Cream, Lotion 1%	The exact mechanism unknown; however, it has been reported to distort the hyphae and to stunt mycelial growth in susceptible organisms. Inhibition of squalene epoxidation has also been reported.
<b>Undecylenic acid</b>	Ointment (Zinc undecenoate 8%, Methyl salicylate 2.5%, Terpineol 2%)	This organic acid will interact non-specifically with components in the cell membrane.

**Herbal Treatment of Skin Diseases:**

About 17 thousand species of Indian flora about 75 hundred species of higher plants are reported to possess medicinal value and in other countries it is projected about 7 and 13 percent. There are estimated to be around 25 thousand effective plant-

based formulations, used in folk medicine and known to rural communities in India. The parts of plants used for herbal medicinal preparations vary from leaves, stem barks, seeds, roots, fruits, and flowers respectively. These are found in Table 3 (Filaire, E., et al. 2018 and D'Aniello, C., et al. 2017).

**Table 2:** List of 15 herbal medicinal plants used in treatment of skin diseases

BOTANICAL NAME	FAMILY	COMMON NAME	PARTS USED	SKIN PROBLEMS
<i>Aloe biteri</i>	Liliaceae	Aloe vera	Leaves	Boils and dandruff
<i>Allium cepa</i>	Liliaceae	Onion	Bulb	Rashes
<i>Cassia alata</i>	Caesapiniaceae	Ringworm plant	Leaves	Eczema and Ringworm
<i>Chromlaena odorota</i>	Compositae	Awolowo weed, Siam weed	Leaves	Wounds and Insect stings
<i>Ficus exasperata</i>	Moraceae	Sand paper plant	Leaves	Ringworm
<i>Heliotropium ovaliphoilum</i>	Boraginaceae	Cockscomb	Leaves wound	wound
<i>Rauvolfia vomitora</i>	Apocynceae	Swizzle	Seeds and roots	Skin disease
<i>Talinum trianulare</i>	Portulacaceae	Water leaf	Leaves	Cuts, wounds and scabies
<i>Terminalia catapa</i>	Combreta ceae	Almond tree	Bark and leaves	Leprosy and scabies
<i>Vitex doniana</i>	Verbena ceae	Black plum	Leaves and bark	Ringworm
<i>Azadirachta indica</i>	Meliaceae	Neem	Leaves, bark and seed oil	Skin diseases
<i>Lawsonia inermis</i>	Lythraceae	Mehendi	Leaves	Skin infections
<i>Butea monosperma</i>	Fabaceae	Palaso	Flowers	Leprosy
<i>Ricinus communis</i>	Euphorbiaceae	Joda	Seed oil	Itching
<i>Euphorbia hirta</i>	Euphorbiaceae	Khirni, Dudhir	Whole plant parts	Antiseptic
<i>Argemone mexicana</i>	Papaveraceae	Udosho mari, Khurokonta	Seed	Eczema

**Conclusion:**

Herbal medicinal plants can possibly cure various types of skin diseases. More than 70-80 percentages of individuals in India rely on upon customary human services and utilize distinctive plant based items for curing skin related issues. Contrasted and the routine allopathic medications, they have moderately minimal effort and can be of incredible advantage to the number of inhabitants in India when all is said in done and needy individuals specifically. This has further led to the decline of medicinal plants

drastically in their natural habitat. Therefore, attention should be paid towards the conservation of such resources which in turn will lead to develop strategy for conservation of rich biodiversity.

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