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Review Article

Management of Psoriasis: A Review of Current Treatments and Ethnobotanical Surveys for Anti-psoriasis Studies

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ABSTRACT

Psoriasis is a chronic, immune-mediated skin disease which affects a large number of people across the globe and is accompanied with keratinocytes hyperproliferation and skin inflammation. The management of psoriasis includes a comprehensive plan that includes a combination of traditional medicines with other newer strategies to enhance outcomes in patients. This report discusses the most widespread methods, including topical medications, systemic therapies (like many biologics), as well as phototherapy. The use of these treatments has shown to be helpful in resolving clinical symptoms but continuous intake of these treatment options can have negative consequences and or reduced effectiveness thus making it necessary to look for other options. Ethnopharmacological studies are imperative in the search for anti-psoriatic drugs as many plants have been shown to have the ability to reduce inflammation and the activity of the immune system. Different societies have used these traditional medicinal plants such as Aloe vera, Curcuma longa and Silybum marianum to manage psoriasis and the bioactive compounds obtained from them have been shown to possess anti-inflammatory and anti-oxidant properties in recent studies. The purpose of this article is to close the gap between traditional treatments and the ethnobotanical approach, while calling for deeper investigations of treatments based on plants.

INTRODUCTION

Psoriasis is a skin condition that is inflammatory and persistent, characterised by a complicated, multivariate aetiology and autoimmune processes. Although it can happen at any age, the 50–69 age range is the most common [1] Countries' reported psoriasis prevalence ranges from 0.09% to [2] and

11.4% [3] making psoriasis a severe worldwide issue Despite not being contagious, psoriasis may be a debilitating and disfiguring condition that is incurable and can negatively affect a patient's quality of life. Some of the common symptoms observed in patients with psoriasis include dry cracked skin that bleeds or itches, burning itchy

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thick red skin with silvery-white scales and occasionally thick ridged, pitted nails. These symptoms are usually found on the elbows, knees, scalp, trunk, palms, and soles of the feet. [4] Histological characteristics of psoriasis include a thinned or missing granular layer, elongated and dilated capillaries, suprapapillary thinning, an inflammatory infiltration of T cells in the dermis and epidermis, and occasionally clusters of neutrophils in the parakeratotic scale. One of the disease's histological characteristics is acanthosis, or thickening of the epidermis. It might be a sign of psoriasis if neutrophil clustering is seen surrounding pustules or parakeratosis.[5] Expression of psoriasis is influenced by the interaction of genes and environment. This means that exposure to certain drugs, stress, alcohol, smoking, infections (especially streptococcal), antimalarials, non-steroidal inflammatory agents, and, in certain situations, sunlight, can all cause the disease to appear before it does.2 Living with psoriasis may result in weight gain and obesity, which are risk factors and triggers.[6]

Epidemiology and Global burden

Psoriasis is a global condition. It impacts all ages of men and women worldwide, irrespective of their ethnic background [1] According to certain research, 75% of psoriasis cases developed before the age of 46, with an average age of onset of 33 years [7] Additionally, there are data points to a possible rise in psoriasis prevalence [3]. Numerous studies have shown that psoriasis can have a significant negative influence on quality of life (QoL), even when it only affects a small portion of the body (BSA) [8,9,10,11,12]. The Global Burden of Disease Study's results indicate that there is a significant burden of psoriasis, as per the WHO's 2016 assessment on the disease [1]. Disability-adjusted life year (DALY) is a common statistic used to calculate burden. The total of years lost from life (YLLs) and years lived with a disability (YLDs) is known as the DALY. One

year of a healthy life lost is equivalent to one DALY. The estimated global average DALY for psoriasis in 2010 was 1,050 660, double that of acute hepatitis C. [1] Psoriasis patients are more likely to experience vascular inflammation and subclinical atherosclerosis [13]. In addition, compared to healthy people, they have noticeably increased blood lipid levels, which include triglycerides and total cholesterol [14]. Moreover, psoriasis is related with atrial fibrillation and stroke, which may be worsened in young individuals [15]. The psychological effects of psoriasis can be severe. Psoriasis in highly visible parts of the such as skin, hands and face, makes life extremely tough for patients. Correlated psychological issues might impact daily social interactions as well as employment. It increases the likelihood of sadness, induces anxiety, shame, and low self-esteem [16,17]. Psoriasis patients report feeling angry or powerless more often than other patients, and they also report having thoughts of suicide more frequently. 9.7% of the 127 psoriasis patients in the research said they wished they were dead, and 5.5% said they were actively considering suicide at the time of the study [18].

Pathophysiology

Psoriasis is inflammatory illness that is caused or triggered by T cells. Pathogenesis of psoriasis involves T-cell activation, T cell migration, and T cell release of cytokines [19, 20]. Inflammatory mediators, CD4+ and CD8+ T-cells, and primarily invading T-cell markers including IL-2, IL-8, and TNF- α receptors are abundant in psoriatic cells, leading to hyperproliferation of keratinocytes and activation of epidermal cells. In the past, it was unclear exactly where psoriasis originated. Numerous academic publications have demonstrated that cytotoxic CD8+ T lymphocytes are more common in psoriatic lesion epidermis, while CD4+ cells are more common in psoriatic dermis. The surface expression of CD45RO by these dermal cells indicates their effectors and

memory state in relation to the pathophysiology of psoriasis [21,22,23]. Environmental stress, microbes, toxins, etc., stimulate the T cell receptor by binding to the antigen-presenting cell (APC) of major histocompatibility complex (MHC I or II). This is followed by the interaction of surface molecules on the T cell, such as CD2, with leukocyte function associated antigen (LFA)-1 on the APC [24]. Ultimately, the production of primary signal for psoriasis is the consequence of antigen MHC complexes forming with the surface of APCs, connection with T cell receptors, and engagement with CD4/CD8 co-receptors on T cell surface [24]. Secondary signal is initiated by interactions between CD40 and CD40L, CD28 and CD80, CD28 and CD86, and LFA3 with CD2. Both primary and secondary signals are required for complete T cell activation. Its activation provokes neo-angiogenesis in the dermis and proliferation of keratinocyte [24,25].

Current Therapies

For individuals with mild or localised psoriasis, topical corticosteroids are frequently the first line of treatment. By downregulating inflammatory pathways, they function by lowering inflammation, preventing cell division, and narrowing blood arteries. The selection of corticosteroid strength and formulation should be dependent on the location of the lesions to avoid unwanted effects. In comparison to using them separately, combination formulations of corticosteroids with vitamin D analogues or keratolytic drugs, including halobetasol propionate and tazarotene, are frequently more effective and have fewer adverse effects [26,27]. The mechanism of action of topical vitamin D analogues is to promote keratinocyte differentiation while blocking keratinocyte growth. They don't need to be administered heavily unless the patient has renal impairment. Burning and irritation are possible side effects, however they normally go away with time [28].

Tacrolimus and pimecrolimus are examples of topical calcineurin inhibitors that are mostly used to treat psoriatic lesions in the face and intertriginous regions. They work by preventing T cell activation and preventing the manufacture of IL-2 and IFN-. Like topical vitamin D analogues, topical calcineurin inhibitors mostly cause burning and skin irritation as adverse effects. The chance of these adverse effects can be decreased by first administering topical corticosteroids, as they can be more noticeable in places with significant inflammation [29]. Salicylic acid and tazarotene [27] are examples of topical keratolytic that help break down thick scales on psoriasis plaques. Tazarotene a retinoid prevents keratinocyte growth, while salicylic acid lessens scaling. Burning and irritation can be reduced by varying the formulation, concentration, or frequency of administration, or by mixing them with topical corticosteroids. Finally, certain light wavelengths are used in targeted phototherapy, such excimer light therapy, to treat localised plaque psoriasis. After about two months of therapy, it can result in a considerable improvement with a low chance for carcinogenicity. Blisters and a burning feeling are possible adverse effects that can be avoided with the right treatment plan [30]. To treat moderate-to-severe psoriasis, phototherapy techniques such as narrowband UV-B, broadband UV-B, and PUVA have been employed. The narrowband UV-B variant has a superior safety profile and is more effective than the broad band type. UV-B phototherapy inhibits DNA synthesis, which causes keratinocytes to undergo apoptosis and produces less pro-inflammatory cytokines. Erythema, pruritus, blistering, photoaging, and photo carcinogenesis are examples of adverse consequences. [31] Methotrexate, apremilast, acitretin, and cyclosporine are among the oral therapeutic choices for plaque psoriasis [32]. With the exception of cyclosporine, oral therapies often have lower efficacies than biologics. For



individuals who choose non-injectable therapy or have restricted access to biologics, oral medicines may still be taken into consideration. Biologic therapies represent a major advancement in the treatment of moderate to severe psoriasis, specifically targeting key immune pathways involved in the disease's pathogenesis. Tumour necrosis factor- α (TNF-), a cytokine implicated in inflammation, is the target of a family of drugs known as TNF-inhibitors. Etanercept, infliximab, and adalimumab are three TNF-inhibitors that are often utilised. TNF-inhibitors usually show a response after 12 to 16 weeks of continuous therapy; however, infliximab often shows a response after 8 to 10 weeks. Moderate-to-severe psoriasis patients have shown their efficacies and long-term safety profiles [33, 34]. Severe infections, recurrence of hepatitis B and C, TB, drug-induced lupus, and demyelinating central nervous system disorders were among the numerous severe side events that were documented [35, 36]. Effective IL23 inhibitors for psoriasis therapy include ustekinumab, guselkumab, risankizumab, and tildrakizumab. By blocking their common p40 subunit, ustekinumab is the sole biologic that targets both IL-12 and IL-23 [37]. The development of biologic medicines and small molecule inhibitors that target particular pathways implicated in the pathophysiology of psoriasis has attracted substantial attention as alternative treatments under investigation. The interleukin (IL)-23 inhibitor mirikizumab has demonstrated encouraging outcomes in clinical trials. Mikikizumab significantly reduces inflammation and improves psoriatic skin lesions by focussing on the IL-23/Th17 pathway. [37] Furthermore, developments in topical treatments, microneedles, topical nanocarriers, biomarker development, and the application of multi-omics hold great promise for deciphering the intricate molecular mechanisms underlying psoriasis. A multifaceted approach may result in the creation of

more potent medications and individualised treatment plans.

Challenges in the Current Treatment of Psoriasis and Need for herbal medicine for the treatment of psoriasis

Biologic agents have revolutionized the treatment landscape for psoriasis, particularly in patients with moderate-to-severe disease. However, despite their effectiveness, several challenges and limitations persist in the use of these medications. One of the major challenges is the occurrence of primary and secondary treatment failures or inadequate responses to initial treatment. While biologic agents have shown high response rates, there is a subset of patients who do not respond to these treatments, leading to primary treatment failure [38]. This emphasises the need for more accurate treatment response predictors to pinpoint patients who will benefit most from a specific biologic drug. The Psoriasis Stratification to Optimise Relevant Therapy (PSORT) consortium has met to discuss this issue and to determine what causes therapy non-response. A patient who responded favourably to a treatment at first may experience secondary failure, which is defined as decreasing efficacy. The patients' development of neutralising antibodies is one reason why the effectiveness may have decreased [39]. The management of psoriasis may be improved by switching to a second biologic therapy if the first one proves ineffective or has side effects [40,41]. Biologic therapy can be expensive, which is a serious problem. Due to the high cost of these drugs, both individuals and healthcare systems bear a financial burden. When asked about their need for a more affordable treatment alternative, most psoriasis sufferers responded positively to a survey [42]. Numerous psoriasis subtypes may also present particular difficulties in maintaining and achieving treatment satisfaction, including generalised pustular psoriasis (GPP) [43], palmoplantar psoriasis (PPP) [44], genital [45],



nail [46], and scalp [47]. The current therapeutic options frequently fail to meet the needs of these particular groups. More investigation and advancement are required to more precisely and efficiently meet the unique requirements of diverse patient populations.

Ethnobotanical Survey for Herbal Alternative Aloe vera

Aloe vera is a succulent perennial that is widely used as a folk cure for a variety of ailments, especially skin conditions, all over the world. This plant produces gel that is commonly utilised in dietary supplements, medications, and cosmetics. Many potentially health-promoting compounds, such as anthraquinones, polysaccharides, vitamins, salicylic acid, and an abundance of antioxidants, including carotenoids and flavonoids, are present in aloe vera extract lowering skin irritation and inflammation, several of those substances help slow down the progression of psoriasis. Experimental studies in vitro demonstrate that aloe vera extract can interfere with many proinflammatory pathways, including blocking NF- κ B, MAPK, and PI3K signalling, as well as lowering iNOS, oxidative stress, IL-6, and IL-1 production macrophages, and lowering prostaglandin E2 levels by Cox blockage. In a psoriatic model, HaCat cells were used to induce TNF- α in the investigation. [47,48] Aloe vera also has anti-inflammatory, antioxidant, immunomodulatory, anti-tumor, and anti-fungal properties. Additionally, it promotes skin hydration and wound healing by boosting collagen activity. This aids in healing the damaging consequences caused to psoriatic skin [49]. Newer Aloe vera compositions for topical use are being researched.

Curcuma longa

Turmeric, also known as *Curcuma longa* or *Curcuma domestica*, has long been utilised in traditional medicine. It is a member of the Zingiberaceae family [50]. The anti-inflammatory

compounds sesquiterpenes, zingiberene, and curcuminoids are extracted from the rhizomes of turmeric [50] The epidermis's phosphorylase kinase is specifically inhibited by curcuminoids and volatile oils, which has an anti-inflammatory effect [51]. The number of psoriatic cells reduced while the number of dead and apoptotic cells increased after curcumin therapy. Curcumin slowed down the growth of psoriasiform cells by downregulating cytokines such as TNF- α , IL-6, IL-17, and INF- γ . It improved the function of the epidermal barrier by upregulating involucrin and filaggrin [52] to determine if topical turmeric microemulgel is beneficial in treating plaque psoriasis, a clinical experiment involving 34 participants was conducted. It was discovered to be successful and enhanced the patients' quality of life [53]

Centella asiatica L

Centella asiatica L it is a member of the Apiaceae family and is also known as *Hydrocotyle asiatica L*. In dermatology, centella asiatica is frequently used to treat the symptoms of skin conditions. Centelloids, or pentacyclic triterpenoids such as asiaticoside, madecassoside, asiatic acid, and madecassic acid, are the main components of *Centella asiatica*. Additionally, it includes centella saponin D, terminolic acid, oleanane, and isothankunic acid type saponins [54]. It was found that it also has significant potential as DNA damage preventing agents and natural antioxidants [55]

Silybum marianum

A member of the Asteraceae family, *Silybum marianum* is an annual herbaceous plant. It was brought to the globe as a weed by its origins in the Mediterranean areas. Psoriasis is treated using silymarin and taxifolin, which are found in *silybum marianum*. Vitamin E, linoleic acid, and α -linolenic acid are present in *Silybum marianum* oil [56]. The pathophysiology of psoriasis is significantly influenced by helper T-cells (Th).



The milk thistle plant is the source of taxifolin, sometimes referred to as dihydro-quercetin. Taxifolin was discovered to be able to prevent imiquimod-induced psoriasis in BALB/c mice and lipopolysaccharide-induced aberrant keratinocyte proliferation in human keratinocyte cell lines, as compared to control. In skin draining lymph nodes and skin lesions, taxifolin reduces the ratio of Th1 to Th17 cells. Additionally, via inhibiting transcription factors such as GATA-3, T bet, and ROR γ t, as well as the Jak2/Stat3 and Notch1 pathways, it controls the development of Th cells and reduces inflammation in psoriatic circumstances [57]

Matricaria Recutita

The plant species *Matricaria recutita*, or chamomile, is a member of the Asteraceae family. Chamazulene isolated from flower is the main phytochemical with anti-psoriatic properties. By preventing lipoxygenase from functioning, chamazulene inhibits the production of leukotriene B₄ (LTB₄), which has anti-inflammatory properties. Psoriatic plaques exhibit an increase in LTB₄ formation. Therefore, LTB₄ inhibition will demonstrate the advantageous effects of chamazulene. Flavonoids such as apigenin and quercetin are present in the flower [58]. A flavonol with antibacterial, antiviral, anti-tumor, and anti-inflammatory properties is quercetin. It prevents NF- κ B and STAT-1 from being activated by IFN γ . It lowers the synthesis of IgE and histamine. Nitric oxide synthase (iNOS), TNF- α , and IL are all inhibited by it. Quercetin functions through many pathways and may be a useful therapy for psoriasis. The flavone apigenin has anti-inflammatory and antioxidant properties. It produces anti-inflammatory effect by preventing the luciferase reporter gene from being transactivated by TNF- α [59]. Several other herbal plants have been used to treat psoriasis, including *Capsicum annuum* [60], *Gaultheria procumbens*

[61], *Psorospermum febrifugum* [62,63,64] and *Melaleuca alternifolia* [65]

Phytochemicals Possessing Anti-Psoriatic Activity

A member of the flavonoid family, rutin is a polyphenolic hydrophobic chemical found in a variety of foods, including citrus, apples, *Betula* leaves, buckwheat, black tea, and green tea [66]. This material is associated with anti-inflammatory and antioxidant activities, and it has been utilised in several studies to assess its potential as an active component in pharmaceuticals [67]. Because of their anti-inflammatory qualities, polyphenols like kaempferol have a significant impact on disorders like psoriasis that are brought on by inflammation. Liu et al. [68] showed that kaempferol reduced the production of main proinflammatory cytokines and weakened the psoriatic skin lesion and inflammation. Resveratrol is a polyphenol known for its strong anti-inflammatory, anti-cancer, antidiabetic, and antioxidant properties [69]. In an animal model of imiquimod-induced psoriasis, resveratrol reduced the production of proinflammatory cytokines like IL-17-A, IL-19, and IL-23. It also promoted keratinocyte death, most likely via activation of SIRT1 and inhibition of Akt kinase. In vitro experiments on NHEK cells demonstrate that resveratrol can reduce the proliferation of epidermal keratinocytes. One of the components of turmeric, curcumin, has been used as a medicine in Southeast Asia for millennia. It contains anticancer, antibacterial, anti-inflammatory, and antioxidant properties [70]. Docking studies have proved that Curcumin can directly bind to TNF-and its receptor, influencing or even disrupting the signal transduction process and reducing inflammation caused by this cytokine [71]. Plants, such as *Rheum palmatum*, *Polygonum cuspidatum*, *Polygonum multiflorum*, *Aloe vera*, and *Cassia obtusifolia*, are the source of the anthraquinone derivative emodin [72]. It has several pharmacological properties, such as



anticancer properties. Pure natural polyphenolic component called rottlerin is extracted from *Mallotus philippinensis*. It has been reported that this chemical has antihypertensive, antifertility, and antiallergic properties [73]. Rottlerin is a strong inhibitor of keratinocyte proliferation, as demonstrated by in vitro investigations on HaCaT cells, where it inhibits both basal and hydrogen peroxide-stimulated NF- κ B activation [74]. Flavonoids such as quercetin are present in the plants *Hypericum perforatum* [75] and *Ginkgo biloba* [76]. Numerous biological characteristics of this flavonoid are present, such as anti-inflammatory, antioxidant, cardioprotective, vasodilatory, liver-protective, and anticancer effects [77]. Through in vitro investigations on the C6 cell line—rat glioma cells—Kieko et al. [78] reported that quercetin exhibits anti-inflammatory effect, which is characterised by numerous unique signalling pathways, including MAPK signalling and NF- κ B pathway regulation. Natural flavonoids include apigenin. Many different food products include it, such as tea, celery, onions, parsley, thyme, and sweet pepper [79]. It poses characteristics that are antioxidant, antibacterial, and anti-inflammatory. Strongly inhibiting NF- κ B activation in autoimmune cells is apigenin, a non-mutagenic plant flavone [80].

CONCLUSION

Psoriasis is regarded as a skin disorder that is chronic in form and is also immune mediated, and individuals suffering from this condition may have to endure a number of physical, social and psychological consequences. The treatment for psoriasis in the present scenario includes a number of options, which are topical agents, systemic therapies, biologics and even phototherapy. Even though the majority of patients are able to benefit and experience an improved quality of life with the help of these treatments, issues such as incomplete remission, side effects from medications, and economic constraints still exist. Therefore, the

importance of novel effective and safer therapies is essential. According to ethnobotanical studies, it is possible to approach the therapy of psoriasis with medicinal plants that are known in traditional medicine as alternative and / or adjunct treatment. Some of these plants, in addition to being able to be researched for new drug development, have anti-inflammatory, immunomodulatory and antioxidant properties. However, despite some preclinical in vitro and in vivo work being promising, the clinical translation of these ethnobotanical treatments has unfortunately been lacking in support. In the future work aims, herbal compounds used in treatment of psoriasis should be evaluated in randomized control trials to assess their efficacy and safety. The integration of traditional knowledge and new drug development approaches can help address some treatment gaps, improving the efficacy and gentleness of treatment interventions. The help of other specialists such as dermatologists, ethnobotanists and pharmacologists may help the acceptance and use of ethnobotanical intervention in modern treatment regimens so that patients will have an effective and inexpensive and safe method for managing psoriasis over a long time.

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