



Contents lists available at ScienceDirect

Journal of Ayurveda and Integrative Medicine

journal homepage: <http://elsevier.com/locate/jaim>

Case Report

Potential implications of Ayurveda in Psoriasis: A clinical case study

Guruprasad C. Nille*, Anand Kumar Chaudhary

Department of Rasa Shastra and Bhaishhya Kalpana, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, 221005, India



ARTICLE INFO

Article history:

Received 15 May 2020

Received in revised form

24 September 2020

Accepted 25 November 2020

Available online 3 February 2021

Keywords:

Psoriasis
Auspitz sign
Ayurveda
Kushtha
Herbs
Case report

ABSTRACT

Immune response of a human body to the uncertain factors leads to the accelerated inflammatory proliferation of the ailing cells of the skin known as Psoriasis. Although the condition found described many decades ago, the etiology and treatment look under-researched. In Ayurveda, many herbs have proven efficacy in psoriasis, but the multifaceted etiology of the disease needs a multimodal treatment approach. We report about Ayurveda treatment in a 68-year-old female patient with plaque psoriasis presented with erythematous plaques on the anterior surface of the legs, right forehead, and neck region. The Auspitz sign and Koebner phenomenon were positive. The treatment protocol was adopted as per Ayurvedic samprapti (pathophysiology) and the patient cured completely without reporting any adverse events after the one year of treatment. No recurrence observed even after one year of the halted treatment. The importance of a wholesome diet as a health promoter is also revalidated. Photographic documentation was recorded with the proper consent of the patient during successive treatment and regular follow-ups. Altogether, multimodal Ayurveda treatment led to speedy and substantial recovery from a chronic case of psoriasis.

© 2020 The Authors. Published by Elsevier B.V. on behalf of Institute of Transdisciplinary Health Sciences and Technology and World Ayurveda Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Psoriasis is a chronic immune-mediated inflammatory condition mainly affecting the skin and joint. Its prevalence in India is about 0.44–2.8 percent. Males are being affected by psoriasis two times more common than females [1]. Various sites of the body such as scalp, face, trunk, limbs, palms, and soles involve in psoriasis. The diagnosis of psoriasis depends on tissue biopsy and distribution of skin damage. Plaque psoriasis (*Psoriasis vulgaris*), Inverse psoriasis, Guttate psoriasis, Pustular psoriasis, and Erythrodermic psoriasis are a few of the clinical patterns reported in psoriasis cases [2]. The chronic nature, recurring pattern, and visibility of psoriasis produce a great adverse impact on the psychological and social aspects of patients' life. Psychosocial disability affects their daily work as well as social interactions. In Ayurveda, skin diseases have collectively considered under a common term of *Kushtha*. Most of the formulations described in *Kushtha chikitsa* have efficiently been used by the physicians to treat different skin ailments. However, due to the complex pathophysiology and chronic and relapsing nature of

psoriasis, the multimodal treatment approach has been adopted covering the *Jirnajwara chikitsa*, *Vatarakta chikitsa*, and *Rasayana chikitsa* along with *Kushtha chikitsa*. In the present case, the multimodal Ayurveda treatment approach resulted in early recovery from psoriatic lesions with no recurrence so far.

1.1. Patient information

A 68-year-old female homemaker had been diagnosed as plaque psoriasis and was treated by a consulting dermatologist wherefrom the patient was taking allopathic treatment for three years with regular follow-ups. Topical and systemic immunosuppressive therapy was resulted in symptomatic relief during the last treatment. Personal history revealed that the patient's general health was good. All the blood tests (routine tests) were within a normal range. No concomitant illness was found associated. However, due to a recurring pattern caused by the unknown aggravating factors, the patient discontinued allopathic treatment and consulted for *Ayurveda* treatment.

2. Clinical findings

The patient presented with erythematous plaques on the anterior surface of the shin bone, forehead, and neck region. The

* Corresponding author.

E-mail: drguruprasadnille0412@gmail.com

Peer review under responsibility of Transdisciplinary University, Bangalore.

affected skin was found with a variable shade of red color and the surface covered with large silvery scales (Fig. 1a and b). The patient was suffering from itching and burning all over the body. At the time of the case presentation, the Auspitz sign and Koebner phenomenon found positive. No signs of psoriatic arthritis and nail bed psoriasis were found.

2.1. General examination

Body temperature (97.6 °F), Pulse (88/min), and Blood Pressure (118/86) were within normal limit.

2.2. Systemic examination

In systemic examination, respiratory and cardiovascular system found normal. The patient was restless due to itching and burning sensation over psoriatic lesions.

2.3. Asthavidha pariksha

Nadi (pulse) – *Pittakaphaja*; *Mala* (stool)– *Sandra-picchila*, bowel habit was regular; *Mutra* (urine) – *Prakrita*; *Jivha* (tongue)– *Shveta-picchila*, *Sama* (coated); *Shabda* – *Prakrita*; *Sparsha* (touch)– *Ushna*; *Drika* (vision) – *Prakrita*; *Aakriti* – *Madhyam* (medium built).

2.4. Nidana panchaka

Nidana – *Viruddhahara sevana* (simultaneous use of milk and salty snacks) and *Raktadushtikar Ahara-vihara* (excessive use of salty food, sour food like pickles, curd and sitting a long time in direct sunlight); *Samprapti* – *Dosha* – *Pitta*, *Kapha* and *Rakta*; *Dushya* – *Rasadhatu*, *Raktadhatu* and *Mamsadhatu*; *Agni* – *Mandagni*; *Aam* – *Jatharagni* and *Dhatvagni janya*; *Strotasa* – *Rasavaha*, *Raktavaha* and *Mamsavaha*; *Adhithana* – *Twaka*; *Rogamarga* – *Bahya*; *Vyadhi Swabhava* – *Chirakari* (chronic); *Sadhyasadhyata* – *Kricchrasadhya* (difficult to treat); *Poorva roopa* – *Abhyantara daha*

(feeling of warmth), *Kandu* (itching), *Mukhapaka* (mouth ulcers) and *Mandagni* (anorexia); *Roopa*: *Jwara* (fever), *Trishna* (thirst), *Daha* (burning sensation), *Kandu*, *Tvakavaivarnyata* (in present case, skin with a variable shade of red color and the surface covered with large silvery scales.), *Balahani* (generalized weakness); *Upashaya* – *Bahya shita sparsha* and *Abhyanga* (improvement on wet cold sponging and oil application); *Anupashaya* – *Ushna sparsha* (increased symptoms on work in hot and humid climate).

2.5. Diagnostic assessment

All routine blood tests were within a normal range. The patient was not ready for tissue biopsy due to unaffordable cost. Therefore, based on clinical presentation, distribution of the skin damage, and positive Auspitz sign, the case diagnosis was confirmed as plaque psoriasis.

3. Therapeutic interventions

All oral and topical modern medications stopped. In this case, the involvement of *pitta* and *kapha dosha* ascertained by observing the clinical presentation such as *Daha* (burning sensation), *Kandu* (itching), *Raktavarnata* (redness), and the nature of skin lesions. Vitiated *pitta* and *kapha dosha* found involved in the pathological progress. The details of the internal and external medications prescribed have been mentioned in Table 1.

The details of all the prescribed medicines including their classical reference, ingredients, and indications are given in Supplementary Table 1.

4. Timeline

In the present case, all the treatment was continued for one year. *Pathyahara* (A strict dietary plan) continued for the next one year after the end of active treatment to check the recurrence of psoriasis.



Fig. 1. Periodic clinical outcomes in response to Ayurveda treatment.

Table 1
List of internal and external medications with dose, adjuvant, and duration.

Sr. No.	Formulation	Dose, frequency and time	Adjuvant	Duration ^a
1.	<i>Patolakaturohinyadi kashaya</i> (Herbal decoction)	20 mL of kashaya, twice daily on an empty stomach	50 mL of lukewarm water	6 Month
2.	<i>Kaishor guggulu</i> (Tablet)	1 gm (2 tablets) twice daily, after meal	Lukewarm water	6 Month
3.	<i>Mahatiktaka ghrita</i> (Capsule of medicated ghee)	2 gm (4 capsules), once daily on an empty stomach at early morning	Warm water	6 Month
4.	<i>Gandhaka rasayana</i> (Tablet)	250 mg (2 tablets) twice daily, after breakfast	Water	6 Month
5.	<i>Khadirarishta</i> (Herbal fermented liquid)	20 mL of arishta, twice daily after meal	50 mL of normal water	6 Month
6.	Winsoria oil (Herbal coconut base oil)	Twice a day, Topical application	–	1 Year
7.	Strict dietary plan	Restricted use of salt, sour food items, curd, old butter, milk and sweet products, meat and fish, overeating etc.	–	2 Years

^a (All the internal medicines continued for the next six months by reducing their aforementioned prescribed doses to the half and with the same frequency, time, and adjuvant.).

5. Follow up and outcomes

The Follow-ups details with timeline, treatment protocol, and periodic clinical outcome have been mentioned in Table 2. The psoriatic lesions with all its signs and symptoms cured. No adverse events witnessed during the treatment. Photographs of affected areas before and after the treatment are shown in Fig. 1. The patient kept only on a strict dietary regimen for the next year but no recurrence observed. Photographs captured with the consent of the patient revealed the same results after the two years (Fig. 1g,h).

6. Discussion

Psoriasis is an autoimmune disease where genetic and environmental factors have a significant role [3]. Moreover, cytokines, inflammatory cascade, and keratinocytes play an important role in the pathogenesis of psoriasis [4]. Among different types of psoriasis, plaque psoriasis (psoriasis vulgaris) is the most common form of psoriasis where silvery-white scales with raised areas of reddened skin are known as Plaques [2]. Being an autoimmune disease, it is quite difficult to treat. Therefore, the treatment principles of *Jirnajwara chikitsa*, *Vatarakta chikitsa*, *Rasayana chikitsa*, and *Kushtha chikitsa* have been implemented together.

In the present case, *pitta*, *kapha*, and *rakta* were the *Doshas*, and *Rasadhatu*, *Raktadhatu*, and *Mamsadhatu* were the *Dushyas*. *Doshadushya samurcchana* (pathological progress) was taken place due to the circulation of vitiated *Doshas* and their *Sthanasamshraya* (site of pathological changes) at *Tvaka* (skin) with the clinical presentation of *Vyadhilakshnanas* (signs and symptoms of psoriasis). The treatment protocol was adopted for *Samprapti bhedana* (to counteract the pathophysiology) where *Pitta-kaphahara*, *Jirnajwarahara*, *Vataraktahara*, and *Rasayana* along with *Kushthaghna aushadhiyogas* (medicines) were preferred. Also, the *Agnidipana*

(improvement of the biological fire), *Ampachana*, *Rasaprasadana* (improvement in the quality of blood), and *Raktaprasadana* (purification of the blood) were achieved with the help of all the internal medicines. The intake of *Viruddha ahara* (the unwholesome dietary practices) is one of the important causative factors in the etiopathogenesis of skin diseases. The patient should avoid *Viruddha ahara* for better treatment response, speedy recovery, and to avert the recurrence in chronic skin ailments. In present case, the patient was following the excess use of salty and sour food items, old butter and curd, spicy food, simultaneous use of milk products and salty snacks, etc. The patient was taking modern medications without sidestepping the causative factors as per *Ayurveda*. Therefore, temporary relief had observed with a relapsing pattern during the allopathic treatment. Thus, in the present case, the strict dietary regimen (*Pathya*) has been advised as the mitigating intervention along with *Ayurveda* medicines.

The ongoing pathological changes were attenuated and corrected following internal medications such as *Patolakaturohinyadi kashaya* [5], *Kaishor guggulu* [6], *Mahatiktaka ghrita* [7], *Gandhaka rasayana* [8], and *Khadirarishta* [9]. The multimodal *Ayurveda* treatment approach was adopted by considering all the possible pathomechanism.

Patolkaturohinyadi kashaya has mentioned under *Shodhanadigana* in *Astangahridaya*. It is enriched with *Tikta rasa* (bitter) *dravyas* that help in the *Rasadhatu* and *Raktadhatu prasadana* by pacifying vitiated *kapha* and *pitta doshas*. It has *kushthaghna* (corrects skin ailments), *Jwaraghna* (antipyretic), and *Vishaghna* (anti-poison) properties [5]. It is useful in skin diseases associated with itching, pigmentation, and burning sensation. It is also an effective medicine for liver detoxification. According to *Ayurveda*, the liver is an important organ for the normal functioning of *pitta dosha* and *raktadhatu*. It improves appetite and aids in digestion due to *Amapachana* and *Agnivardhana* properties.

Table 2
Follow-up history and clinical outcomes.

Timeline	Dates	Treatment plan	Periodic clinical outcomes
Onset of treatment	20/04/2018	As per Table 1	<i>Ayurveda</i> treatment started.
Follow-up 1	29/05/2018	As per Table 1	Subjective improvement in signs and symptoms. Itching and redness reduced.
Follow-up 2	28/06/2018	As per Table 1	Observational changes in signs and symptoms (Fig. 1c, d). Auspitz Sign found negative.
Follow-up 3	31/07/2018	As per Table 1	Significant improvement in all signs and symptoms. No itching and burning sensation.
Follow-up 4	28/08/2018	As per Table 1	Recovered completely (Fig. 1e, f). No itching and burning sensation.
Follow-up 5	23/10/2018	Dose of medicines reduced to half	No recurrence found. Normal biochemical profile.
Follow-up 6	16/04/2019	Only dietary regimen continued	No recurrence found.
Follow-up 7 (telephonic conversation)	22/10/2019	Only dietary regimen continued	No relapse in any sign and symptom.
Follow-up 8	30/04/2020	Only dietary regimen continued	No relapse in any sign and symptom (Fig. 1g, h).

Various scientific reports reveal the promising effects of *Guggulu* (*Commiphora mukul* Hook ex Stocks.) against different chronic diseases such as psoriasis, dermatitis, skin diseases, infectious diseases, arthritis, etc. It is due to its anti-inflammatory and anti-oxidant effects by targeting multiple signaling pathways [10]. Terpenoidal constituents, steroids, flavonoids, guggulipol, lignans, sugars, and amino acids present in *Guggulu* are responsible for its therapeutic effects [11]. *Guggulu* is well known for its *yogavahi* (synergism) property in *Ayurveda*. *Guggulu* can act as a drug carrier by entrapping active pharmaceutical ingredients and mediate their sustained release action [12]. Guggulipid found as effective as tetracycline in the treatment of nodulocystic acne proving the anti-infective and antibacterial properties of *Guggulu* [13]. *K. guggulu* is a polyherbal preparation indicated in *Vatarakta* and well known for its *Kantikara* (restores skin's natural radiance and suppleness) property in *Ayurveda* [6]. It reduces inflammation and pain associated with *Vatarakta* by purifying blood. Furthermore, *K. guggulu* acts as an antiallergic, antibacterial, and blood purifying agent [14]. Therefore, it helps to reduce redness, inflammation and acts as a natural blood cleanser by its pacifying effects on deep sited vitiated *doshas* of psoriasis.

M. ghrita, a medicated ghee has administered internally for *shamana* (pacifying effect on *dosha*) purpose. A capsulated form of ghee (3 mL/capsule) was used instead of the classical dosage form to overcome the palatability problem due to its very bitter taste. In the case of *Kushtha* (skin diseases), *doshas* exist in *dhatu*s such as *Rasa*, *Rakta*, *Mamsa*, and *Meda*. Ghee has *sukshma*strotogamitva action and it can reach and also nourish the *Shukra dhatu*. Moreover, in *Kushtha* the medicated ghee fortified with *Tikta* and *Kashaya rasa* has been recommended for internal and external use. Various active phytoconstituents extracted in the *Mahatiktaka ghrita* work synergistically to cure psoriasis, possibly through the liposomal drug delivery system [15].

Gandhak (sulfur) in *Ayurveda* has *Kushthaghna* property. It's *Garavishahar* (anti-poisonous) and *Rasayana* (rejuvenation) properties help to cure and correct the causes of skin diseases [16]. According to modern science, sulfur possesses an anti-

inflammatory and anti-oxidant property which plays an important role in the treatment of autoimmune diseases such as psoriasis and psoriatic arthritis [17]. It is known for its *Kushthaghna*, *Kledaghna*, *Ampachana*, *Raktaprasadana*, and *Rasayana* properties. In *Gandhak rasayana*, purified sulfur has been treated with different medicinal herbs to improve its pharmacological actions to many folds [8].

Arista Kalpana is a continuous hydro-alcoholic extraction method wherein various phytoconstituents from raw herbs reach into the medium. *Arista* shows better therapeutic efficacy due to biological transformations into phytochemical compounds mediated by microbes [18]. *Khadirarista* has recommended for all types of *Kushtha*. Most of the ingredients of *Khadirarista* possess anti-psoriatic action. The heartwood decoction of *Khadir* (*Acacia catechu* Willd.) has since long been used to treat skin ailments including psoriasis in a traditional practice. It helps to purify the blood. It has immunomodulatory action that may activate both cell-mediated as well as humoral immunity. Among various phytoconstituents present in *Acacia catechu*, catechins may contribute to its anti-inflammatory and antioxidant activities [19]. In an experimental study, the water extract of *Acacia catechu* showed inhibition of pro-inflammatory cytokine TNF- α and a significant increase in cytokine IL-10. IL-10 helps to control the secretion of pro-inflammatory cytokines by augmenting the proliferation of B cells, mast cells, and thymocytes [20]. *Darvi* (*Berberis aristata* DC.) has anti-inflammatory activity. In skin diseases, the aqueous extract of *B. aristata* is found effective internally as well as externally [21]. Topically applied *B. aristata* extract loaded transferosomal gel showed marked improvement in inflammatory changes of psoriatic skin of experimental animals [22]. Since ages, *Bakuchi* (*Psoralea corylifolia* Linn.) has also been used for its promising results in various skin ailments. It contains various phytoconstituents such as flavonoids, alkaloids, coumarins, meroterpenes, and essential oils which contribute to its multifaceted pharmacological actions including anti-inflammatory, antioxidant, anti-leprotic, antipsoriatic, antibacterial, anticancer and immunomodulatory activities [23,24]. *Dhataki pushpa* (flowers

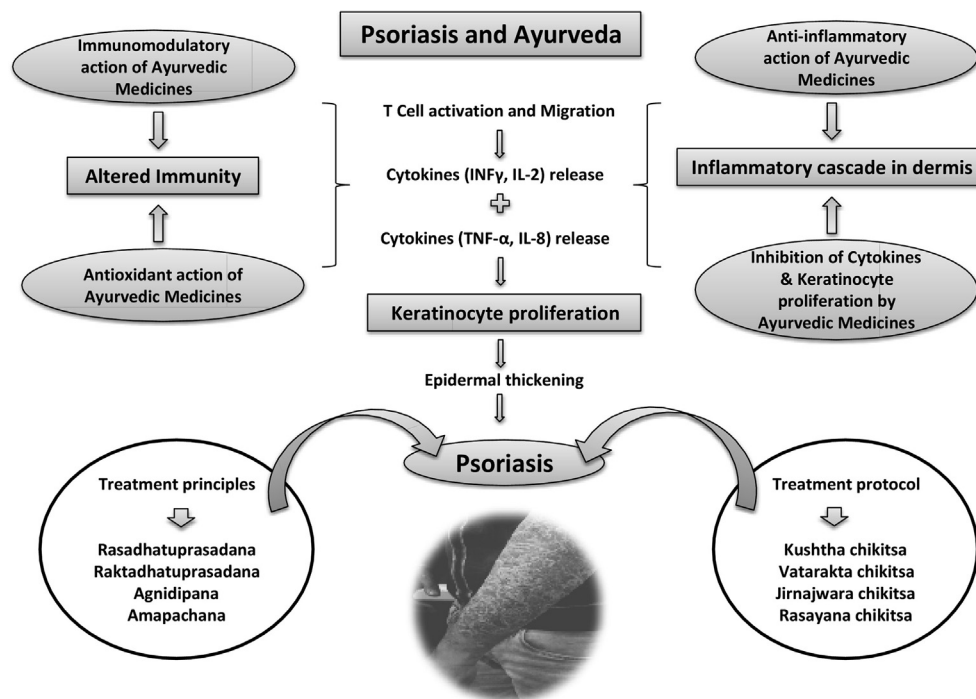


Fig. 2. The possible actions of Ayurveda drugs in Psoriasis.

of *Woodfordia fruticosa* Kurz.) is useful in inflammation and skin diseases [25].

After the treatment of the first six months, the prescribed doses of all the internal medicines were reduced to the half by considering the age, gender, *roga* and *rugna Bala* (severity of the disease and the condition of the patient) and, *rogavastha* (stages of the disease) [6].

In the present case, winsoria oil has prescribed for external use. In winsoria oil, coconut oil (*Cocos nucifera* (L.) Kuntze.) has processed with *Vidaphala* (*Wrightia tinctoria* R. Br.), *Manjishta* (*Rubia cordifolia* Linn.), and *Sariva* (*Hemidesmus indicus* R. Br.). Winsoria oil carries all the active pharmaceutical ingredients from these herbs and helps to cure psoriasis by enhancing their permeation across the skin. It retards hyperkeratinization, silvery scales, inflammatory responses, reduce exfoliation, and discoloration of the skin. It also prevents itching and formation of scales and sores. *Vidaphala* is useful in psoriasis [26]. It has anti-inflammatory and anti-dandruff properties and it is commonly used in hair oil preparations. In 777 Oil, a coconut oil-based herbal preparation for psoriasis, the leaf extract of *W. tinctoria* has been used [27]. *Manjishta* is known for its *Raktashuddhikara*, *Pitta-kaphahara*, *Vranaropana* (wound healing), and *Kushthaghna* properties. It also has an antipsoriatic activity. Ethyl acetate fraction of ethanolic extract of its root formulated in the form of topical gel exhibited inhibitory action on keratinocyte proliferation in the mouse tail model [28]. *Sariva* has also reported for anti-inflammatory, immunomodulatory, and antioxidant properties. It is effective in psoriasis due to its *raktaprasadana*, *dahaprashamana* (reduces burning sensation), and *shothahara* (anti-inflammatory) properties [29]. Coconut oil improves the symptoms of skin disorders by its moisturizing, soothing, and emollient effects. It possesses anti-inflammatory activity. It suppresses the inflammatory markers such as cytokines, prostaglandins, leukotrienes, and protects the skin by improving skin barrier function. In psoriasis, epidermal keratinocytes react to pro-inflammatory cytokines like tumor necrosis factor- α (TNF- α) and interferon- γ (IFN- γ). Interleukin 6 (IL-6) causes epidermal hyperplasia in the psoriatic epithelium. Coconut oil intervenes in anti-inflammatory activity by reducing the secretion of IL-6 level. Uncontrolled cytokine expression can lead to dysfunction of the epidermal barrier as seen in psoriasis. The topical application of coconut oil inhibits the various cytokine levels including TNF- α , IFN γ , IL-6, IL-5, and IL-8 [30].

The promising outcomes in the present case are a combined effect of all the *Ayurveda* medicines, *pathya sevana* (a strict diet plan), and regular follow-ups by the patient. The possible mechanism and role of *Ayurveda* medicines in the *Samprapti-vighatana* (counteracting the pathophysiology) of psoriasis have depicted in Fig. 2.

7. Patient perspective

The patient shared her perspective about the *Ayurveda* treatment in her local (Hindi) language. She had severe itching, burning sensation, and stress at the time of presentation, while she was free from all the signs and symptoms at the end of treatment.

8. Conclusion

In the present case, the treatment protocol was adopted as per *Ayurvedic samprapti* and the treatment response was observed much earlier as compared to previous allopathic treatment. No recurrence reported after the end of active treatment. The importance of a wholesome diet as a health promoter is also revalidated. The external and internal medications of *Ayurveda* help to correct the complex pathophysiology of psoriasis like chronic diseases.

Altogether, multimodal *Ayurveda* treatment led to speedy and substantial recovery from a chronic case of psoriasis.

9. Informed consent

Consent of the patient was obtained for the photographs and before reporting the case report for publication.

Source(s) of funding

We are grateful to the Kerala *Ayurveda* Limited, Head Office, Athani Post, Aluva, Ernakulam District, Kerala – 683585, India, for sponsoring the Article Publishing Charges.

Conflict of interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jaim.2020.11.009>.

References

- [1] Thappa DM, Munisamy M. Research on psoriasis in India: where do we stand? *Indian J Med Res* 2017;146(2):147–9. https://doi.org/10.4103/ijmr.ijmr_1296_17
- [2] Rendon A, Schäkel K. Psoriasis pathogenesis and treatment. *Int J Mol Sci* 2019;20:1475. <https://doi.org/10.3390/ijms20061475>.
- [3] Reali E, Brembilla NC. Editorial: immunology of psoriatic disease. *Front Immunol* 2019;10:657. <https://doi.org/10.3389/fimmu.2019.00657>.
- [4] Baliwag J, Barnes DH, Johnston A. Cytokines in psoriasis. *Cytokine* 2015;73(2): 342–50. <https://doi.org/10.1016/j.cyto.2014.12.014>.
- [5] Gaud BL, editor. (reprint). *Astanga hrdaya of vagbhata, sootra sthana; shodhanadiganasamgraha*: [chapter 15], verse 15. Varanasi: Chaukhambha Orientalia; 2013. p. 256.
- [6] Shrivastava S, editor. (reprint). *Sharangadhar samhita of acharya sharangadhar, Madhyam khand; Vvataka Kalpana*: chapter 7, verse 70–81, poorva khand; paribhasha: chapter 1, verse 37. Varanasi: Chaukhambha Orientalia; 2016. 204, 10.
- [7] Tripathi B, editor. (reprint). *Charaka samhita of agnivesha, chikitsasthan; Kushtha chikitsa*: chapter 7, verse 144–150. Varanasi: Chaukhambha Surbharati Prakashana; 2013. p. 327–8.
- [8] Shastri L, editor. (reprint). *Yogaratanakar, uttarardh; Rasayanadhikar*: verse 1–8. Varanasi: Chaukhambha Prakashan; 2010. p. 501–2.
- [9] Shastri A, editor. (reprint). *Bhaishajya ratnavali of Shri Govind Das*, chapter 54, verse 365–370. Varanasi: Chaukhambha Prakashan; 2012. p. 914.
- [10] Kunnumakkara AB, Banik K, Bordoloi D, Harsha C, Sailo BL, Padmavathi G, et al. Googling the guggul (commiphora and boswellia) for prevention of chronic diseases. *Front Pharmacol* 2018;9(686):1–19. <https://doi.org/10.3389/fphar.2018.00686>.
- [11] Francis JA, Raja SN, Nair MG. Bioactive terpenoids and guggulosteroids from Commiphoramukul gum resin of potential anti-inflammatory interest. *Chem Biodivers* 2004;1(11):1842–53. <https://doi.org/10.1002/cbdv.200490138>.
- [12] Sarup P, Bala S, Kamboj S. Pharmacology and phytochemistry of oleo-gum resin of commiphora wightii (guggulu). *Sci Tech Rep* 2015;138039. <https://doi.org/10.1155/2015/138039>.
- [13] Thappa DM, Dogra J. Nodulocystic acne: oral gugalipid versus tetracycline. *J Dermatol (Tokyo)* 1994;21(10):729–31. <https://doi.org/10.1111/j.1346-8138.1994.tb03277.x>.
- [14] Bharati PL, Agrawal P, Prakash O. A case study on the management of dry gangrene by kaishore guggulu, sanjivani vati and dashanga lepa. *Ayu* 2019;40(1):48–52. https://doi.org/10.4103/ayu.ayu_244_18.
- [15] Singh N, Chaudhary A. A comparative review study of Sneha Kalpana (Paka) vis-a-vis liposome. *Ayu* 2011;32(1):103–8. <https://doi.org/10.4103/0974-8520.85740>.
- [16] Shastri K, editor. *Rasatarangini of shri sadanand sharma, astam tarang*: chapter 8, verse 36. 11th ed. Varanasi: Motilal Banarasidas; 1979. p. 181.
- [17] Stephen W. Parcel, sulfur in human nutrition and applications in medicine. *Altern Med Rev* 2002;7(1):22–44.
- [18] Chaudhary A, Singh N, Dalvi M, Wele A. A progressive review of Sandhan Kalpana (Biomedical fermentation): an advanced innovative dosage form of *Ayurveda*. *Ayu* 2011;32(3):408–17. <https://doi.org/10.4103/0974-8520.93925>.
- [19] Ismail S, Asad M. Immunomodulatory activity of *Acacia catechu*. *Indian J Physiol Pharmacol* 2009;53(1):25–33.

- [20] Sunil MA, Sunitha VS, Radhakrishnan EK, Jyothis M. Immunomodulatory activities of *Acacia catechu*, a traditional thirst quencher of South India. *J Ayu Integr Med* 2019;10(3):185–91. <https://doi.org/10.1016/j.jaim.2017.10.010>.
- [21] Potdar D, Hirwani RR, Dhulap S. Phytochemical and pharmacological applications of *Berberis aristata*. *Fitoterapia* 2012;83:817–30. <https://doi.org/10.1016/j.fitote.2012.04.012>.
- [22] Nimisha Rizvi DA, Fatima Z, Neema, Kaur CD. Antipsoriatic and anti-inflammatory studies of *berberis aristata* extract loaded nanovesicular gels. *Phcog Mag* 2017;13(Suppl 3):S587–94. https://doi.org/10.4103/pm.pm_210_17.
- [23] Khushboo PS, Jadhav VM, Kadam VJ, Sathe NS. *Psoralea corylifolia* Linn. —“Kushtanashini”. *Phcog Rev* 2010;4(7):69–76. <https://doi.org/10.4103/0973-7847.65331>.
- [24] Zhang X, Zhao W, Wang Y, Lu J, Chen X. The chemical constituents and bioactivities of *Psoralea corylifolia* Linn.: a review. *Am J Chin Med* 2016;44(1):35–60. <https://doi.org/10.1142/s0192415x16500038>.
- [25] Srivastava AK, Nagar HK, Chandel HS, Ranawat MS. Antipsoriatic activity of ethanolic extract of *Woodfordia fruticosa* (L.) Kurz flowers in a novel *in vivo* screening model. *Indian J Pharmacol* 2016;48(5):531–6. <https://doi.org/10.4103/0253-7613.190740>.
- [26] Ramchandra P, Basheermiya M, Krupadanam GL, Srimannarayana G. Wrightial, a new terpene from *Wrightia tinctoria*. *J Nat Prod* 1993;56(10):1811–2. <https://doi.org/10.1021/np50100a022>.
- [27] Srivastava R. A review on phytochemical, pharmacological, and pharmacognostical profile of *Wrightia tinctoria*: adulterant of *kurchi*. *Phcog Rev* 2014;8(15):36–44. <https://doi.org/10.4103/0973-7847.125528>.
- [28] Lin ZX, Jiao BW, Che CT, Zuo Z, Mok CF, Zhao M, et al. Ethyl acetate fraction of the root of *rubia cordifolia* L. Inhibits keratinocyte proliferation *in vitro* and promotes keratinocyte differentiation *in vivo*: potential application for psoriasis treatment. *Phytother Res* 2010;24(7):1056–64. <https://doi.org/10.1002/ptr.3079>.
- [29] Nandy S, Mukherjee A, Pandey DK, Ray P, Dey A. Indian Sarsaparilla (*Hemidesmus indicus*): recent progress in research on ethnobotany, phytochemistry and pharmacology. *J Ethnopharmacol* 2020;254:112609. <https://doi.org/10.1016/j.jep.2020.112609>.
- [30] Varma SR, Sivaprakasam TO, Arumugam I, Dilip N, Raghuraman M, Pavan KB, et al. *In vitro* anti-inflammatory and skin protective properties of Virgin coconut oil. *J Tradit Complement Med* 2019;9(1):5–14. <https://doi.org/10.1016/j.jtcm.2017.06.012>.