Pharmacological Review on Psoriasis and Its Screening Methods

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Abstract: Psoriasis is a chronic inflammatory autoimmune skin disorder that is continuing to be a burden worldwide and there is still no cure. The major types of psoriasis are Pustular and Non-pustular psoriasis and are further classified as psoriasis vulgaris, guttae psoriasis, psoriatic arthritis, erythrodermic, palmoplantar, guttate, flexural psoriasis, localized and generalized, impetigo herpetiformis psoriasis, etc. The most common triggers for psoriasis are environmental and genetic factors and the exact cause is still unknown. Various treatment is used to control and maintain psoriasis, but still, there is no complete cure for the disorder.

INDEX TERMS: Psoriasis, parakeratosis, erythematous plague, hyperplasia, acanthosis, palmoplantar, IL-23, TNF-∝.

I. INTRODUCTION:

Psoriasis is a chronic, recurring, inflammatory skin disease that affects 2-3% of the population worldwide, with 0.7% in Indians, and causes significant morbidity and mortality. Psoriasis is initiated and maintained in part by proinflammatory cytokines such as IL-23, IL-17, and TNF-∝.[1] The typical lesion is a well-marginated, erythematous plaque with a silvery-white surface scale that is primarily seen on extensor surfaces (knees, elbows, buttocks), but can also affect the palms and scalp. Additionally, psoriatic arthritis and nail abnormalities are included.

The redness is caused by vascular changes, epidermal hyperproliferation, and inflammation. Although the specific cause of the condition is unknown, it is widely accepted to be a chronic autoimmune inflammatory disease with a hereditary factor. Psoriasis has been described as demonstrating benign **hyperplasia** based on its histological features, which include **acanthosis** (thickened epidermis) and **parakeratosis** (nucleated cells in stratum corneum). Lymphocytic infiltration is usually observed in the dermis and occasionally in the epidermis, and the dermal blood vessels are abnormally convoluted and dilated. The skin's stratum spinosum layer contains **Antigen Presenting Cells** (APC), which are activated by an unidentified antigen to cause the autoimmune illness. As in an immune-stimulated situation, activated APC moved to a local lymph node and presented the antigen to dendritic cells, which caused clonal growth and T-cell differentiation. Once T cells are activated, they become the main factor in the pathogenesis of the illness, disrupting keratinocytes' normal processes of cell division and differentiation through the production of **cytokines** and **chemokines**.[2]

II. TYPES OF PSORIASIS:

A. Non-pustular psoriasis

a. Psoriasis vulgaris or plague psoriasis
b. Guttate psoriasis
c. Erythrodermic psoriasis
d. Palmoplantar psoriasis
e. Psoriatic arthritis (psa)
f. Inverse or flexural psoriasis

B. Pustular psoriasis

a. Generalized pustular psoriasis (von Zumbusch type)
b. Localized pustular psoriasis
- Palmoplantar pustulosis (barber type)
- Acrodermatitis continua of hallopeau

c. Impetigo herpetiformis

Non-pustular psoriasis:

Psoriasis vulgaris:

The majority of cases of psoriasis are the clinical variety known as psoriasis Vulgaris, which accounts for 90% of all occurrences. There is a chance of both early and late onsets. It appears as erythematous plaques with defined boundaries and iridescent squamae in a clinical environment. The knees, elbows, scalp, and sacral region are where lesions are most frequently found. There is a symmetrical distribution of lesions. The predisposition of the lesions may result from a stressful experience. When the psoriatic plaque's surface is scraped with a blunt scalpel, squamae emerge as layers of white lamellae that show coherence after removal, much like candle wax. Another name for this desquamation is the wax mark phenomenon. It represents a parakeratotic hyperkeratosis symptom. By completely scraping the psoriatic plaque, it may be possible to spot a wet covering that has clung to the lesion. The final layer of the dermal papillae of the epidermis is known as the "last membrane phenomenon." When the plaque is scraped further, an erythematous backdrop, bleeding foci, and the "Auspitz sign," which indicates papillomatosis on the ends of dermal papillae, appear. There might be a hypopigmented macular ring around cleared psoriatic plaques.

Fig 1: PLAGUE PSORIASIS OR PSORIASIS VULGARIS

Guttate psoriasis:

Children and young adults are typically affected by this kind of psoriasis. Small droplet-like lesions that are less typically seen as squamous psoriatic papules unexpectedly emerge, usually following streptococcal infections. The HLA-Cw6 gene is most usually linked with this type of psoriasis. Antistreptolysin titers are frequently high. Lesions typically go away on their own as the illness starts to get better. Typically, lesions are seen on the head, face, and proximal parts of the limbs. Usually, they regress after 3 to 4 months. Psoriatic plaque-like lesions can occasionally grow and take on this form.[2]

Erythrodermic psoriasis:

With this type of psoriasis, over 80% of the body's surface is covered in psoriatic lesions. Mostly erythematous lesions are visible, and typical papules and plaques lose their distinguishing characteristics. Desquamation doesn't stand out. Widespread vasodilatation can cause hypothermia in erythrodermic psoriasis sufferers. Desquamation can result in protein loss as well as other systemic issues such as lower extremity edema and cardiac, hepatic, and renal failure. Furthermore, the skin's protective barrier is weakened, which increases the possibility that systemic responses may manifest. The most common way it manifests is as a complication of psoriasis Vulgaris, however, erythrodermic psoriasis can sometimes present on its own. Extremely extreme nail abnormalities can occur. There may be significant pruritus and dermatopathic lymphadenopathy. It is important to check for psoriatic or pityriasis rubra pilaris (PRP) erythroderma when there are tiny patches of undamaged skin present in an erythroderma patient. No particular laboratory result was discovered. These findings need to be continuously monitored since there is a significant risk of cardiovascular shock or septic shock.[2]

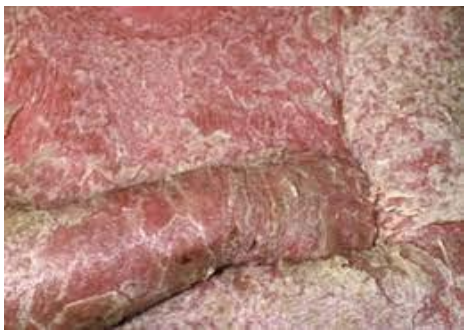

Fig 2: ERYTHRODERMIC PSORIASIS

Palmoplantar psoriasis:

The palms of the hands and soles of the feet are often afflicted symmetrically by this kind of psoriasis, and thenar areas are more commonly affected than hypothenar regions. However it is not always present, erythema manifests as a pinkish-yellow lesion. The most common lesions are squamae. Keratoderma can look like thick squamae.[1] Most studies estimate that **3-4% of all psoriasis** patients are **palmoplantar**. Even though it only affects the palms and soles, the fissures, tissue stiffening, and hyperkeratosis interfere with daily activities.[4]

Psoriatic arthritis (PsA):

Average male: female ratio is 1:1 in PsA. In 75% of patients with PsA, psoriasis onsets before the appearance of arthritic symptoms, while in 15%of cases, skin lesions are seen concurrently with arthritis. In 10% of patients, arthritis manifests before the emergence of skin lesions. In 80% of patients with arthropathic psoriasis, nail involvement is seen.[2] They are further seen in different clinical forms such as Classical PsA, Asymmetric oligoarticular arthritis, Symmetric polyarticular form, Arthritis mutilans, and spondylitis form psoriasis.[3]

Inverse psoriasis:

Psoriasis that is localized in skinfolds is termed flexural or inverse psoriasis. Genital psoriasis comes under this category. Squamousa lesions do not form due to friction and moisture in skin folds. Lesions manifest as bright red, symmetric, infiltrative, fissured plaques with distinct contours. Fissured plaques with sharp contours are diagnostic for this form of psoriasis. It is more frequently seen in obese individuals, and there is a tendency to develop seborrheic lesions. This form is generally more resistant to classical treatments.

Pustular psoriasis:

Generalized pustular psoriasis:

This is a rarely seen form of psoriasis that progresses with pustules. It is most frequently seen in young individuals. It can develop independently or as a complication of psoriasis Vulgaris, such as secondary to abrupt withdrawal of systemic steroid treatment, intervening triggering factors, hypocalcemia, or irritant treatment. It onsets suddenly on an erythematous background in association

with general symptoms, such as high fever, lassitude, and polyarthralgia. An increase in sedimentation rate, leukocytosis, lymphopenia, and negative nitrogen balance can be seen. Pustules dry within a few days, followed by the eruption of new pustules. Peripustular erythema tends to disseminate, and thus it can result in erythroderma. It should be promptly treated. If the disseminated form is not treated, the acute phase may lead to a fatal course.[2]

***Localized pustular psoriasis*:**

Palmoplantar pustulosis is divided into 2 forms: Barber's pustular psoriasis and acrodermatitis continua of Hallopeauj.

Pustular psoriasis of the Barber type:

It is a chronic, recurrent form more frequently seen in women and those with a family history of palmoplantar pustulosis. Clinically, it is observed as 2–4mm-sized pustules localized on the palmoplantar region, especially erythematous thenar and hypothenar regions. While its etiology is not precisely known, underlying contact sensitivity is remarkable. Smoking, tonsillitis, humidity, and high temperature may activate the disease.

Acrodermatitis continua (Hallopeau disease):

It is a proximally progressive skin disorder characterized by sterile pustular eruptions involving **fingers and toes** and leading to loss of nails and distal phalanges in severe cases. Pustules become joined, resulting in small, polycyclic, purulent, fluid-filled vesicles. The presence of a variant of psoriasis is still debatable.

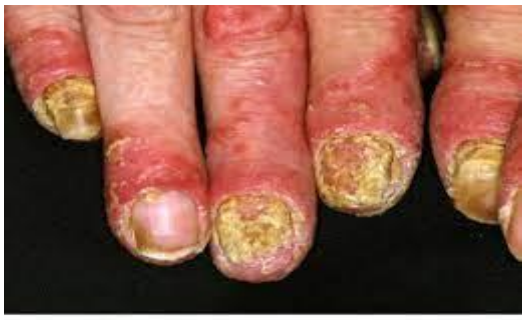

Fig 3: ACRODERMATITIS CONTINUA

Impetigo herpetiformis:

This is a rarely seen type of psoriasis, also known as generalized pustular psoriasis of pregnancy. It is characterized by erythematous lesions covered with pustules, which start and radiate from flexural regions and have the tendency to agglomerate. It may gain vegetative character at skin folds. During its course, involvement of mucous membranes, and onycholysis secondary to subungual pustules can be seen. Lesions itch or cause a burning sensation and have a foul odor. In addition to deterioration of general health, symptoms of lassitude, fever, shivering, nausea, and vomiting may be present. Systemic psoriasis can be associated with lupus erythematosus, malignancy, liver disease, uveitis, brain diseases, diabetes, pulmonary disease, cardiovascular disease, bowel disease, and nephropathy.[5]

III. ETIOLOGY:

The origin of psoriasis is mostly by **environmental and genetic factors.** The main factors include **localized trauma, such as scratching, piercings, tattoos, sunburns, chemical irritants,** etc, that can cause psoriasis. [6,7,8] Streptococcal (gram-positive cocci) is the most important cause of chronic plague psoriasis. Acute Guttate psoriasis is strongly caused by streptococcal infection.

Weather, especially cold, dry conditions, and drugs that can cause psoriasis such as Lithium salts, beta blockers, antimalarial, Nsaids, withdrawal of corticosteroids, and ace inhibitors.

It has been found that cigarettes and alcohol play a detrimental effect on psoriasis. Alcohol may exacerbate the pre-existing disease but does not induce disease. The effect is **more seen in men than women.** Chronic drinkers tend to have more extensive and inflamed diseases.[6]

IV. PATHOPHYSIOLOGY OF PSORIASIS:

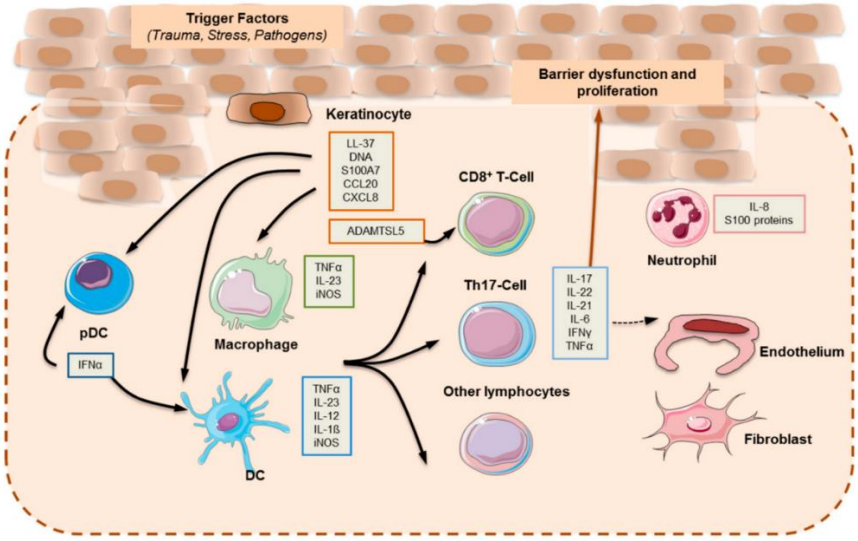

Figure 4 PATHOPHYSIOLOGY OF PSORIASIS

Psoriasis' pathogenesis is not well understood. The onset of illness is influenced by a variety of variables, including genetic, immunologic, environmental, and stress-related factors. It is thought that activated T cells are the main regulators in the development of psoriasis.[9,10]

Interleukin-1 (IL-1), IL-6 (IL-6), tumor necrosis factor (TNF), and proinflammatory transcription factors NF-B (nuclear factor kappa light chain) signal transduction and transcription as well as AP-1 Activator Protein have all been linked to disordered cellular immunity. Each of the four main kinds of inflammatory cells can be formed from naive T-cells. dependent on the existence of TNF-, (tumour necrosis factor), TNF- and IL-6 (interleukin), Th1 (T helper 1), Th2, Th17, or T regulatory cells. Naive T-cells develop into Th17 cells when TGF- (transforming growth factor) and IL-6 are present.[11]

These activated cells enter the circulation and extravasate through the endothelium to the sites of inflammation in the skin where they produce the Th1-Th2-Th17 imbalance. The role of the IL-23/Th17 pathway has been intensely researched in recent years. IL-23, a heterodimer composed of p19 and p40 subunits, is produced by dendritic cells and macrophages. It causes the activation of Th17 cells to produce IL-17 and IL-22. Psoriatic skin lesions contain high mRNA IL-23 levels compared to normal skin. Th17 cells are CD4+ (cluster of differentiation) effector cells distinct from the classic Th1 and Th2 lineages and are responsible for providing both innate and adaptive immunity against pathogens.[12,13]

IL-17 (also known as IL-17A) is part of a group of cytokines, called the IL-17 family, consisting of six ligands (A to F), and five receptor family members. IL-17 cytokines are probably critical for the pathogenesis of Psoriasis. IL-17A and IL-17F are the predominant cytokines released by Th17 cells but are also produced by T cells, whereas IL-17C is produced by keratinocytes.

IL-17A and IL-17F act on keratinocytes to stimulate the production of β-defenses and antimicrobial Peptides (AMPs) adenosine mono phosphate and chemokines such as IL-8. In addition, the IL-17 system may also play a role in anti-microbial defense via the maintenance of mucocutaneous immunity.

Elevated levels of IL-17 result in an increase in levels of pro-inflammatory cytokines like S-100, A7, β-defensins, and lipocalin. In addition, increased levels of β-defensins are associated with relative resistance to infections. Increased levels of IL-17 also promote keratinocytes to produce CXC-chemokine and CCL-20, both of which attract neutrophils to the site of inflammation. Increased IL-22 levels lead to epidermal acanthosis and abnormal keratinocyte differentiation.

The role of a new subtype of cells, Th-22 cells, is also considered important in the pathogenesis of Psoriasis. These cells, on activation by TNF-α, IL-6, and CCL20, exclusively produce IL-22 and are involved in epidermal immunity and remodeling.[14]

V. DIAGNOSIS OF PSORIASIS:

Most of the time diagnosis is performed by examining the skin dermatologists. But skin biopsy confirms the type and severity and can rule out the symptoms of psoriasis. Physician checks for **swelling, tenderness, flaking, irritation, etc.**

Also, an X-ray helps to confirm changes in joints that occur in psoriatic arthritis, not in any other arthritic conditions. To rule out gout rather than psoriasis a small sample of fluid from affected joints (knee) uric acid crystals in joint fluid is tested.[15]

C- reactive proteins are elevated in patients with psoriatic arthritis. CRP is a non-specific marker that indicates both acute and chronic inflammation. Significant increase in ESR shows in psoriatic patients.[17]

HLA-B27 is a blood test that looks for a genetic marker for psoriatic arthritis a protein called human leukocyte antigen B27 (HLA-B27), which is located on the surface of white blood cells. About 20 percent of people with psoriatic arthritis are positive for HBL-B27.[16]

VI. SCREENING METHODS :

Invitro:

Proteins were extracted from cell lysates from mouse back skin and western blotting was performed. Protein extracts were prepared by RIPA buffer. Protein amounts extracts were quantitated by a Bio-Rad dc protein assay kit. Equal protein amounts were resolved on 10% SDS-PAGE gels and electrotransferred to nitrocellulose membranes.[18] After blocking with 5% non-fat milk, membranes were probed with specific antibodies against ERK and phosphorylated after washing membranes were incubated with HRP-conjugated antimouse. Immunoreactive signals were detected using chemiluminescence reagents. [18,19]

Invivo:

Imiquimod induced psoriasis:

The 5 % Imiquimod cream induced Psoriasis is an erosive auto-immune disease involving disordered cellular immunity involving inflammatory cytokines (IL-1, IL-6, Tumour necrosis factor-α [TNF-α]) and proinflammatory transcription factor (NF-κB, signal transduction, and transcription and AP-1) has also been implicated.[20,21]

The immune system is well-organized and well-regulated. The deregulation of the immune system may lead to the development of autoimmune diseases.

Psoriasis is a chronic autoimmune condition that causes the rapid build-up of skin cells. This build-up of cells causes scaling on the skin's surface. Inflammation and redness around the scales are fairly common. Typical psoriatic scales are whitish-silver and develop in thick, red patches. Sometimes, these patches will crack and bleed. Psoriasis is the result of a sped-up skin production process. Typically, skin cells grow deep in the skin and slowly rise to the surface. Eventually, they fall off. The typical life cycle of a skin cell is one month.[22]

Psoriasis is induced on the dorsal surface. Dorsal hairs are shaved and depilated on their back using a commercially available depilatory cream.[23] Experimental groups have to be treated daily with an application of commercially available 5% Imiquimod cream on the depilated surface for 6 days and then evaluated for psoriasis scaling by pasi score evaluation.

***UV-induced psoriasis*:**

Male and female mice or rats were chosen. Hairs on the dorsal skin were removed by using a hair depilatory cream. 10% of body surface areas were irradiated for 15, 30, and 45 min at a vertical distance of 20cm with UV light at 385nm after irradiation rats were observed for changes in irradiated skin, and any appearance of skin lesions.[23,24]

VII. EVALUATION OF ANTI-PSORIATIC ACTIVITY EVALUATED BY:

- Pasi score evaluation
- Estimation of nitric oxide level
- Estimation of sod level
- Estimation of il-23 on 5% by Elisa
- Spleen to body weight index

PASI score evaluation:

[Assessment of Psoriatic Area and Severity Index]

The PASI clinical scoring system is used to assess the inflammatory status of the mice's dorsal skin for all 8 days. It included the visual examination of the following three parameters: **erythema** (redness), **induration** (thickness), and **desquamation** (scale) on the back skin of each mouse. Each parameter was given a score between 0 and 4.[25]

- 0-none,
- 1-slight,
- 2-moderate,
- 3-marked,
- 4-very marked

which leads to a cumulative score from 0 to 12. The evaluation will be done and the mean of values calculated.[26]

Estimation of nitric oxide :

Nitric oxide (NO) biosynthesis is measured by determining nitrite levels in the tissues. The tissues are homogenized in hypotonic saline and centrifuged. Nitrite concentrations are determined with Griess reagent. Briefly, the supernatant is mixed with freshly prepared Griess reagent. Sodium nitrite is used as standard. Nitrite levels are expressed as µM/100 mg dry tissue.[27]

Estimation of superoxide dismutase (sod):

The SOD activity in supernatant will be measured by the method of Misra and Fridovich. The supernatant (500µl) was added to 0.800ml of carbonate buffer (100mM, pH 10.2) and 100µl of epinephrine (3mM). The change in absorbance of each sample is then recorded at 480nm in a spectrophotometer for 2min at an interval of 15sec.[20] Parallel blank and standard will be run for the determination of SOD activity. The reaction mixtures are diluted 1/10 just before taking the readings in the spectrophotometer.[28]

Estimation of IL-23 on 5% by Elisa:

The sample is homogenized in a 1.5mL extraction buffer containing 10mM Tris ph. 7.4 150mM Nacl1% triton X-100) per gram of tissue using a glass homogenizer. The homogenates will be transferred to 1.5 mL Eppendorf tubes, centrifuged at 13,000g for 10 minutes at 4˚c and the supernatant will be used to determine Interleukin-23. Some of the other inflammatory mediators such as iNOS and COX-2, as pro-inflammatory cytokines such as **IL-17, IL-6, IL-1β, and TNF-α** result in immune cell activation leading to a severe form of psoriasis.[29]

Spleen to body weight index:

The spleens are carefully removed. Apart from visual examination, the length of each spleen will be determined using a scale in cm and the spleen weight will be recorded in grams using a digital balance. The measurements are expressed as mean ± SD. The values will be statistically analyzed using a one-way ANOVA test.[30]

VIII. TREATMENT:

TREATMENT	DESCRIPTION
RETINOIDS	Tazarotene 0.05% (Tazorac, Avage) is available as a gel and cream and applied once or twice daily. The most common side effects are a burning sensation on the skin, dry skin, flushing or redness of the skin, itching, scaling, and severe redness.
CORTICOSTEROIDS	These drugs are the most frequently prescribed medications for treating mild to moderate Psoriasis. They are available as ointments, creams, lotions, gels, foams, sprays, and shampoos. Mild corticosteroid ointments (hydrocortisone) are usually recommended for sensitive areas, such as your face or skin folds, and for treating widespread patches. Topical corticosteroids might be applied once a day during flares, and on alternate days or weekends only to maintain remission. Triamcinolone 0.1% (Acetonide, Trianex), and clobetasol 0.05% (Temovate) are used for smaller, less-sensitive, or tougher-to-treat areas. Long-term use or overuse of strong corticosteroids can thin the skin. Over time, topical corticosteroids may stop working.[31]
VITAMIN-D ANALOGOUS	Synthetic forms of vitamin D, such as calcipotriene and calcitriol show skin cell growth. This type of drug may be used alone or with topical corticosteroids. Calcitriol may cause less irritation in sensitive areas. Calcipotriene and calcitriol are usually more expensive than topical corticosteroids
CALCINURIEN INHIBITORS	Tacrolimus 0.1% (Protopic) and pimecrolimus 1% (Elidel) reduce inflammation and plaque build-up. They can be especially helpful in areas of thin skin, such as around the eyes, where steroid creams or Retinoids are too irritating or may cause harmful effects.

COAL TAR	Coal tar 5% reduces scaling, itching, and inflammation. It's available over-the-counter or by prescription in various forms, such as shampoo, cream, and oil.
CYCLOSPORINE	About 4 to 5mg Taken orally for severe Psoriasis, cyclosporine (Neoral) suppresses the immune system. It's similar to methotrexate in effectiveness but cannot be used continuously for more than a year. Like other immunosuppressant drugs, cyclosporine increases your risk of infection and other health problems, including cancer.[32]
SALICYLIC ACID	Salicylic acid shampoos 1.8% and 2% and scalp solutions reduce the scaling of scalp Psoriasis. It may be used alone, or to enhance the ability of other medications to penetrate the skin.
TNFα INHIBITORS	The TNF inhibitors (eg: infliximab, adalimumab, and etanercept) are efficacious, and FDA-approved medications for the treatment of moderate-to-severe plaque psoriasis.
HYDROXYUREA	Hydroxyurea is an effective treatment for chronic plaque psoriasis that is relatively simple to prescribe. It has a role in treating psoriasis, and hypereosinophilic syndrome, and should be considered for human immunodeficiency virus-associated psoriasis. Hydroxyurea was found to be an effective systemic treatment for psoriasis in the 1970s, but is used 'off-label'.
THIOGUANINE	It can be given as tablets in low dose daily or pulse dosing. Usually, a low dose of 20 mg to a further 120 mg of the high dose is given for the treatment.
METHOTREXATE	**10 to 25mg** administered weekly as a single oral dose, methotrexate [Trexall] decreases the production of skin cells and suppresses inflammation. It's less effective than Adalimumab [Humira] and Infliximab [Remicade].
IMMUNOTHERAPY	These drugs, usually administered by injection, alter the immune system in a way that disrupts the disease cycle and improves symptoms and signs of disease within weeks. Several of these drugs are approved for the treatment of moderate to severe Psoriasis in people who haven't responded to first-line therapies. Therapeutic options are rapidly expanding. Examples include apremilast, deucravacitinib, cyclosporine, methotrexate, etanercept (Enbrel), infliximab (Remicade), Adalimumab (Humira), ustekinumab (Stelara), secukinumab (Cosentyx).[33,34]
GEOCKERMAN THERAPY	Some doctors combine coal tar treatment with light therapy, which is known as Goeckerman therapy. The two therapies together are more effective than either alone because coal tar makes skin more receptive to UVB light.
LIGHT THERAPY	It is a first-line treatment for moderate to severe Psoriasis, either alone or in combination with medications. It involves exposing the skin to controlled amounts of natural or artificial light. Repeated treatments are necessary.
ANTHRALIN	Anthralin 1.5% (another tar product) is a cream used to slow skin cell growth. It can also remove scales and make skin smoother. It should not be used on the face or genitals. Anthralin can irritate the skin, and it stains almost anything it touches. It's usually applied for a short time and then washed off.
SUNLIGHT, UVB BROADBAND, UVB NARROWBAND & PUVA	Daily exposure to sunlight (heliotherapy) might improve Psoriasis. Before beginning a sunlight regimen, Controlled doses of UVB broadband light (280nm-320nm) from an artificial light source can treat single patches, widespread Psoriasis, and Psoriasis that don't improve with topical treatments. Short-term side effects might include redness, itching, and dry skin. Moisturizing regularly can help ease your discomfort. UVB narrowband light (311-313nm) therapy might be more effective than UVB broadband treatment and in many places has replaced broadband therapy. It's usually administered two or three times a week until the skin improves and then less frequently for maintenance therapy. Narrowband UVB phototherapy may cause more-severe and longer-lasting burns. PUVA includes taking (psoralen) before exposure to UVA light exposure. UVA light

	penetrates deeper into the skin than UVB light and psoralen make the skin more responsive to UVA exposure.
ALTERNATIVE MEDICINES	Taking omega-3 fatty acids supplements, and using aloe vera soothing creams, essential oils, and other Ayurvedic and Siddha medicines may help control and maintain psoriasis.[35]

IX. CONCLUSION:

Psoriasis is a significant and developing illness that affects people of all ages worldwide. Due to the significant frequency of psoriasis all over the world, it is essential to determine its cause and develop more effective medicaments for its maintenance and treatment.

X. ACKNOWLEDGMENT:

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XI. REFERENCES:

1. Yan BX, Chen XY, Ye LR, Chen JQ, Zheng M, Man XY. Cutaneous and Systemic Psoriasis: Classifications and Classification for the Distinction. Frontiers in medicine. 2021:1820.
2. Sarac G, Koca TT, Baglan T. A summary of clinical types of psoriasis. Northern clinics of Istanbul. 2016;3(1):79.
3. Folz-Gray, D. *et al.* (no date) *Psoriatic arthritis testing, explained*, *EverydayHealth.com*.Availableat: https://www.everydayhealth.com/arthritis/psoriatic-arthritis/12-medical-tests-psoriatic-arthritis/ (Accessed: January 24, 2023).
4. Engin B, Aşkın Ö, Tüzün Y. Palmoplantar psoriasis. Clinics in dermatology. 2017 Jan 1;35(1):19-27.
5. Lotem M, Katzenelson V, Rotem A, Hod M, Sandbank M. Impetigo herpetiformis: a variant of pustular psoriasis or a separate entity?. Journal of the American Academy of Dermatology. 1989 Feb 1;20(2):338-41.
6. Ho VC, Griffiths CE, Berth-Jones J, Papp KA, Vanaclocha F, Dauden E, Beard A, Puvanarajan L, Paul C. Intermittent short courses of cyclosporine microemulsion for the long-term management of Psoriasis: a 2-year cohort study. Journal of the American Academy of Dermatology. 2001 Apr 1;44(4):643-51.
7. Squire B. The etiology of psoriasis. British medical journal. 1873 Mar 3;1(638):312.
8. Cram DL. Psoriasis: Current advances in etiology and treatment. Journal of the American Academy of Dermatology. 1981 Jan 1;4(1):1-4.
9. Boehncke WH, Boehncke S, Schön MP. Managing comorbid disease in patients with Psoriasis. BMJ. 2010 Jan 15;340.
10. Barker JN. The pathophysiology of psoriasis. The Lancet. 1991;338(8761):227-30.
11. Yamanaka K, Yamamoto O, Honda T. Pathophysiology of psoriasis: a review. The Journal of dermatology. 2021 Jun;48(6):722-31.
12. Hugh JM, Weinberg JM. Update on the pathophysiology of psoriasis. Cutis. 2018 Nov 1;102(5S):6-12.
13. Voorhees JJ. Pathophysiology of psoriasis. Annual review of medicine. 1977 Feb;28(1):467-73.
14. Fitch E, Harper E, Skorcheva I, Kurtz SE, Blauvelt A. Pathophysiology of psoriasis: recent advances on IL-23 and Th17 cytokines. Current rheumatology reports. 2007 Dec;9(6):461.
15. Psoriasis [Internet]. Mayo Clinic. Mayo Foundation for Medical Education and Research; 2022 [cited 2023Jan24]. Available from: https://www.mayoclinic.org/diseases-conditions/psoriasis/diagnosis-treatment/drc-20355845
16. Basko-Plluska JL, Petronic-Rosic V. Psoriasis: epidemiology, natural history, and differential diagnosis. Psoriasis: Targets and Therapy. 2012 Sep 11;2:67-76.
17. Yadav K, Singh D, Singh MR. Protein biomarker for psoriasis: A systematic review on their role in the pathomechanism, diagnosis, potential targets and treatment of psoriasis. International journal of biological macromolecules. 2018 Oct 15;118:1796-810.
18. Dallaglio K, Marconi A, Truzzi F, Lotti R, Palazzo E, Petrachi T, Saltari A, Coppini M, Pincelli C. E-FABP induces differentiation in normal human keratinocytes and modulates the differentiation process in psoriatic keratinocytes in vitro. Experimental dermatology. 2013 Apr;22(4):255-61.
19. Yue LU, Ailin W, Jinwei Z, Leng L, Jianan W, Li L, Haiming C, Ling H, Chuanjian L. PSORI-CM02 ameliorates psoriasis in vivo and in vitro by inducing autophagy via inhibition of the PI3K/Akt/mTOR pathway. Phytomedicine. 2019 Nov 1;64:153054.
20. Sangaraju R, Alavala S, Nalban N, Jerald MK, Sistla R. Galangin ameliorates Imiquimod-Induced psoriasis-like skin inflammation in BALB/c mice via downregulating NF-κB and activation of Nrf2 signaling pathways. International Immunopharmacology. 2021 Jul 1;96:107754.
21. Sun J, Zhao Y, Hu J. Curcumin inhibits imiquimod-induced Psoriasis-like inflammation by inhibiting IL-1beta and IL-6 production in mice. PloS one. 2013 Jun 25;8(6):e67078.
22. Van Der Fits L, Mourits S, Voerman JS, Kant M, Boon L, Laman JD, Cornelissen F, Mus AM, Florencia E, Prens EP, Lubberts E. Imiquimod-induced psoriasis-like skin inflammation in mice is mediated via the IL-23/IL-17 axis. The Journal of Immunology. 2009 May 1;182(9):5836-45.
23. Geetha M. Anti-psoriatic activity of flavonoids from Cassia tora leaves using the rat ultraviolet B ray photodermatitis model. Revista Brasileira de Farmacognosia. 2014 May;24:322-9.
24. Nagar HK, Srivastava AK, Srivastava R, Ranawat MS. Evaluation of potent phytomedicine for treatment of Psoriasis using UV radiation induced Psoriasis in rats. Biomedicine & Pharmacotherapy. 2016 Dec 1;84:1156-62.
25. Naldi L. Scoring and monitoring the severity of psoriasis. What is the preferred method? What is the ideal method? Is PASI passé? facts and controversies. Clinics in dermatology. 2010 Jan 1;28(1):67-72.

26. Langley RG, Ellis CN. Evaluating psoriasis with psoriasis area and severity index, psoriasis global assessment, and lattice system physician's global assessment. Journal of the American Academy of Dermatology. 2004 Oct 1;51(4):563-9.
27. Sirsjö A, Karlsson M, Gidöf A, Rollman O, Törmä H. Increased expression of inducible nitric oxide synthase in psoriatic skin and cytokine-stimulated cultured keratinocytes. British Journal of Dermatology. 1996 Apr 1;134(4):643-8.
28. Kumar S, Prasad M, Rao R. Topical delivery of clobetasol propionate loaded nanosponge hydrogel for effective treatment of psoriasis: Formulation, physicochemical characterization, antipsoriatic potential and biochemical estimation. Materials Science and Engineering: C. 2021 Feb 1;119:111605.
29. Lowes MA, Suárez-Fariñas M, Krueger JG. Immunology of Psoriasis. Annual Review of Immunology .2014 Mar 21 ;
30. Na Takuathung M, Wongnoppavich A, Panthong A, Khonsung P, Chiranthanut N, Soonthornchareonnon N, Sireeratawong S. Antipsoriatic effects of wannachawee recipe on imiquimod-induced psoriasis-like dermatitis in BALB/c mice. Evidence-Based Complementary and Alternative Medicine. 2018 Oct;2018.
31. Grajdeanu IA, Statescu L, Vata D, Popescu IA, Porumb-Andrese E, Patrascu AI, Taranu T, Crisan M, Solovastru LG. Imaging techniques in the diagnosis and monitoring of Psoriasis. Experimental and therapeutic medicine. 2019 Dec;1;18(6):4974-80.
32. Maul JT, Anzengruber F, Conrad C, Cozzio A, Häusermann P, Jalili A, Kolios AG, Laffitte E, Lapointe AK, Mainetti C, Schlapbach C. Topical Treatment of Psoriasis Vulgaris: The Swiss Treatment Pathway. Dermatology. 2021;237(2):166-78.
33. Orasan MS, Roman II, Coneac A. Evaluation of Psoriasis Patients. Tailored Treatments in Psoriatic Patients. 2018 Nov 5;79763:1-28.
34. Dutta S, Chawla S, Kumar S. Psoriasis: A review of existing therapies and recent advances in treatment. differentiation. 2018;2:10.
35. Lebwohl M, Ting PT, Koo JY. Psoriasis treatment: traditional therapy. Annals of the rheumatic diseases. 2005 Mar 1;64(suppl 2):ii83-6.