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A Review On Psoriasis: A Brief Overview

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Abstract:

Psoriasis is a persistent and aggressive skin condition that requires a range of treatments, including topical, oral, and sometimes injectable or intravenous therapies. In recent years, vitamins have shown potential as adjunctive therapies, offering additional benefits alongside standard treatments for psoriasis. Fat-soluble and water-soluble vitamins can serve as secondary treatments, helping to mitigate side effects from systemic medications, improve patient adherence, and offer a more cost-effective treatment approach. This comparative analysis, based on data from sources like PubMed, Google Scholar, and Wiley Library, provides the first In-depth review of fat-soluble vitamins (A, D, E) and water-soluble vitamins (B2, B6, B12, C) in managing psoriasis. The findings suggest that oral vitamin supplementation may be effective in reducing symptoms and systemic inflammation associated with psoriasis. This review also includes clinical, in vitro, and in vivo study results, supporting the potential of vitamins in psoriasis management. Additionally, it highlights the use of High-Performance Liquid Chromatography for identifying these vitamins. This review underscores the promising role of vitamin therapy in managing psoriasis, suggesting it could offer new possibilities for enhancing treatment outcomes.

Keywords: **psoriasis, plaque, pustular, multimorbidity, biologic**

Introduction:

Psoriasis is an autoimmune disease that often affects the skin, joints, or both. It has a complex genetic basis and affects approximately 2% to 3% of the global population, translating to over 125 million individuals worldwide. The condition is classified into various phenotypes, including plaque, guttate, pustular, inverse, palmoplantar, and erythrodermic types. Common symptoms include itching, discomfort, and a burning sensation, with lesions frequently appearing on the scalp, knees, umbilicus, elbows, and lower back. These lesions can emerge anywhere on the skin and may cover extensive areas, leading to significant impairment in the patients' quality of life, even when the disease is not severe.

Because of the impact of diet, vitamins, and nutrients on psoriasis, dermatologists often evaluate a patient's diet during diagnosis. A well-balanced diet is advised to meet nutritional and caloric needs, which typically includes moderating fat and sugar intake, increasing dietary fiber, and limiting red meat and alcohol consumption. Patients with low serum vitamin levels may be considered for supplementation, as these adjustments can enhance psoriasis treatment and help manage associated comorbidities, including inflammatory bowel disease and cardiometabolic disorders.

Several first-line treatments are available for severe psoriasis management, including medications such as methotrexate, salicylic acid, coal tar, and cyclosporine. However, these treatments can lead to various side effects, particularly for those with moderate to mild forms of the disease. Consequently, vitamins have become essential in treating mild to moderate psoriasis. A range of vitamins and their analogs are utilized either individually or in combination with other medications. Notably, vitamin A and vitamin D, along with three antioxidant vitamins and their derivatives, play critical roles in psoriasis therapy.

The significant role of vitamin D, which is primarily obtained through sunlight exposure, has been extensively researched for its effectiveness in treating psoriasis. Vitamin D contributes to maintaining the skin barrier's homeostasis, and many studies have examined the relationship between vitamin D receptors and susceptibility to psoriasis.Expression of vitamin D receptors and tight junction proteins is often reduced in psoriatic skin.Likewis e, vitamin A and its derivatives are widely applied in psoriasis treatment, with many patients responding favorably to both topical and oral vitamin therapies. Deficiencies in vitamin A are frequently observed in individuals with psoriasis. Additionally, water-soluble vitamins can also be beneficial, particularly when used alongside certain oral medications.

The graphical abstract highlights the important roles of both fat-soluble and water-soluble vitamins in managing psoriasis. As of now, there is no comprehensive review that thoroughly investigates the impact of both vitamin types on psoriasis treatment. This literature review was conducted through electronic searches using resources such as PubMed, Scopus, A.C.S., Web of Science, ScienceDirect, Google Scholar, and library textbooks. The objective of this review is to summarize various researchers' findings regarding the roles of different vitamins in psoriasis treatment and management, ultimately identifying the most effective vitamin forms for promoting psoriasis healing.

Aim

To examine the effects of vitamin A on psoriasis, particularly its role in enhancing skin health, reducing inflammation, and improving overall patient quality of life.

Objectives

1. Evaluate Efficacy: Assess the effectiveness of vitamin A supplementation in diminishing the severity of psoriatic lesions.
2. Analyze Inflammatory Markers: Investigate variations in inflammatory cytokines and other biomarkers related to psoriasis.
3. Assess Quality of Life: Measure the influence of vitamin A on the quality of life and overall well-being of patients.
4. Identify Side Effects: Document any negative effects linked to vitamin A supplementation in patients suffering from psoriasis.
   Plan of Work:
   1. Topic Selection: Identify a specific area of focus regarding the effects of vitamin A on psoriasis.
   2. Literature Review: Perform a thorough review of existing studies and publications related to the topic.
   3. Material Collection: Gather pertinent materials, including research articles, studies, and clinical data about vitamin A and psoriasis.
5. Data Analysis: Examine the collected information to uncover patterns, correlations, and significant results concerning the impact of vitamin A on psoriasis.
6. Data Compilation: Finalize the gathered data, ensuring all relevant information is organized and included.

7. Conclusion: Present a summary of the main findings and their implications regarding the use of vitamin A in psoriasis management.
8. References: Create a comprehensive list of all sources and references utilized during the research process.

Literature Review:

Literature Review Summary on the Role of Vitamins in Psoriasis Management

Psoriasis is a persistent inflammatory skin disorder that causes rapid skin cell production and immune dysfunction. This literature review consolidates findings from various studies exploring the impact of vitamins in managing psoriasis.

1. Vitamins as Supplementary Therapy:

Agnihotri et al. indicate that both fat- and water-soluble vitamins can serve as supplementary treatments for psoriasis, helping to minimize medication side effects, improve patient adherence, and lower treatment expenses.This review highlights clinical studies showing the effectiveness of vitamins A, D, E (fat-soluble) and B2, B6, B12, C (water-soluble) in managing psoriasis symptoms. The study also used High-Performance Liquid Chromatography to chemically identify vitamins used in psoriasis treatments.

2. Topical Vitamin A Acid Efficacy:

Peck et al. conducted a double-blind study using vitamin A acid cream in various concentrations and compared it with a placebo and corticosteroid cream, observing only short-term improvement in a few patients. Their findings suggest that vitamin A acid alone offers limited benefit and that additional research is necessary to determine its effectiveness in combination therapies.

3. Vitamin A Levels in Psoriatic Skin:

Rollman and Vahlquist studied vitamin A levels in psoriasis patients, finding that mild cases had normal retinol-binding protein levels, while severe cases had reduced levels. In affected skin, increased levels of dehydroretinol were found, likely related to higher skin cell turnover. Treatment with retinoid medications raised levels of retinol and carotenoids, pointing to a complex relationship between vitamin A metabolism and psoriasis.

4. Vitamin A Metabolism and Psoriasis:

Wang et al. studied retinol-binding protein 4 (RBP4) and its role in psoriasis in a mouse model, associating disruptions in vitamin A metabolism with abnormal skin cell growth. Their research suggests that proteins related to vitamin A could be therapeutic targets in psoriasis treatment.

5. Psoriasis Pathology and Keratin Production:

Hoffmann et al. described how psoriasis interferes with normal keratinization, leading to improperly formed skin cells. Their work highlights the need for therapies that can restore normal skin cell differentiation and repair functions.

6. Dietary Supplements in Psoriasis:

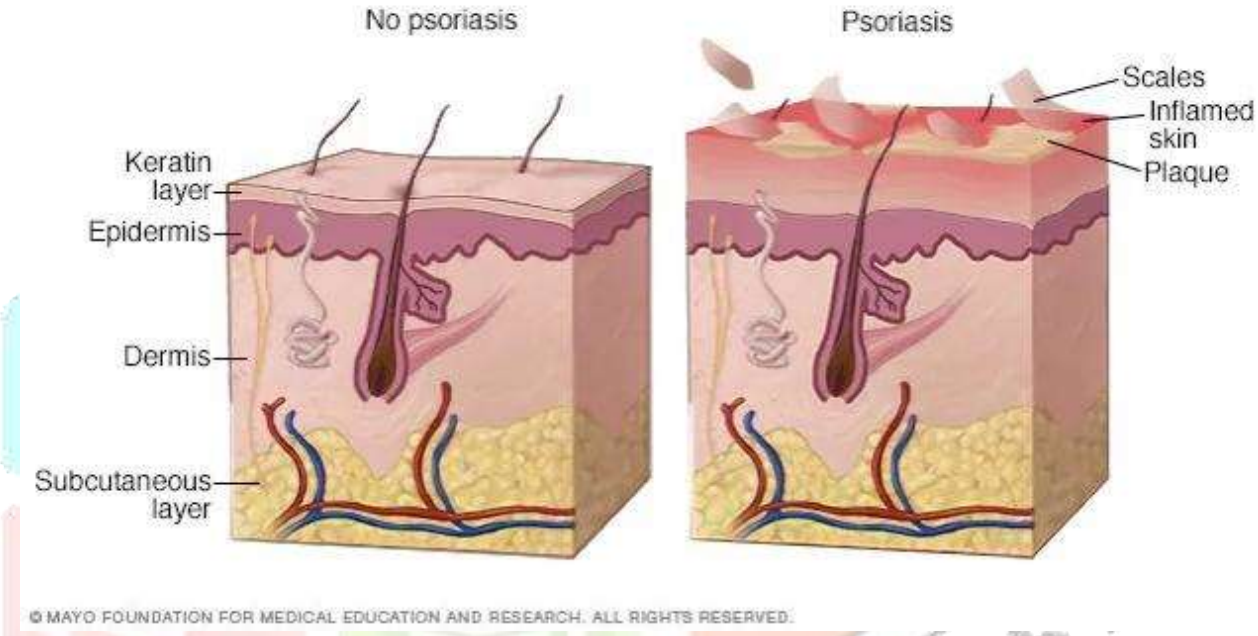
Millsop et al. reviewed the effects of various dietary supplements, including vitamins D and B12, selenium, and omega-3 fatty acids, on psoriasis. Fish oils demonstrated the highest evidence of benefit, though other supplements require more research to confirm their effectiveness. This suggests that patients are interested in exploring alternative therapies, especially those that complement standard treatments.

7. Vitamin A Monitoring in Biologic Therapy:

Campione et al. investigated biologic drugs, particularly Interleukin 17 inhibitors, and their potential to raise fungal infection risks in psoriasis patients. Their study proposes monitoring vitamin A levels in patients using these therapies as a predictor of infection risk, emphasizing the immunoregulatory effects of vitamin A.

8. Overview of Psoriasis Treatments

Caldwell and Spahn offered a general overview of psoriasis and its treatment options, including the potential benefits of vitamins. While vitamins alone may not cure psoriasis, they can help reduce inflammation and work alongside conventional therapies to alleviate symptoms.



Overview of Psoriasis

Fig.no1 Psoriasis and NoPsoriasis

Psoriasis is a persistent skin condition that presents as itchy, scaly rashes, primarily on areas such as the knees, elbows, trunk, and scalp. It is a prevalent, chronic disorder that currently lacks a cure. The condition can be painful, disrupt sleep, and impair concentration. Psoriasis typically follows a cyclical pattern, with flare-ups lasting several weeks or months, followed by periods of remission. Common triggers for individuals predisposed to psoriasis include infections, injuries, burns, and certain medications.

As an autoimmune disease, psoriasis is marked by the rapid proliferation of skin cells, leading to the development of red patches and scales that can be itchy and, at times, painful. Its severity can range from mild to severe, affecting approximately 2% to 3% of the global population, which translates to over 125 million people worldwide.

Psoriasis is categorized into several phenotypes, including plaque, guttate, pustular, inverse, palmoplantar, and erythrodermic types. Symptoms frequently include itching, discomfort, and a burning sensation. Lesions predominantly affect the scalp, knees, umbilicus, elbows, and lower back but can occur anywhere on the body and may cover extensive skin areas. These lesions can be either itchy or painful, significantly impacting the quality of life for patients, even in cases where the disease is not severe.

During the diagnosis of psoriasis, dermatologists evaluate the potential impact of dietary supplements, vitamins, and nutrients on the patient's health. They often recommend a balanced diet that meets nutritional needs while managing caloric intake. This diet typically involves controlled consumption of fats and sugars, along with essential dietary fibers, while limiting red meat, alcohol, and simple sugars. Patients with low serum vitamin levels may be considered for vitamin supplementation, which can enhance the efficacy of psoriasis treatment and help manage associated conditions such as inflammatory bowel disease and cardiometabolic disorders.

For severe forms of psoriasis, several first-line treatment options exist, including methotrexate, salicylic acid, coal tar, and cyclosporine. However, these treatments can have significant side effects, especially in patients with moderate or mild psoriasis. Therefore, vitamins have become crucial in the management of these milder forms of the disease.

Currently, a variety of vitamins and their analogs are used either alone or in conjunction with other medications to treat psoriasis. Key therapeutic vitamins include vitamin A and vitamin D, along with three antioxidant vitamins

and their derivatives, all of which play essential roles in effective treatment. The therapeutic properties of vitamin D,

Fig.2 Psoriasis

typically acquired through sun exposure, have been researched extensively over the years. Vitamin D contributes to maintaining the skin barrier's homeostasis in psoriasis, and studies have shown a connection between specific vitamin D receptors and susceptibility to the disease.Expression of vitamin D receptors and tight junction proteins is often reduced in psoriatic skin.Vitamin A and its derivatives are widely used in psoriasis treatment, and both topical and oral vitamin therapies have produced positive responses in patients. Many individuals

Pathophysiology of Psoriasis

Psoriasis is a widespread chronic inflammatory skin condition that presents as white, scaly plaques. It arises from a combination of genetic and environmental factors rather than a single cause. Key features of psoriatic skin include epidermal thickening, known as acanthosis, which occurs due to the accelerated turnover of keratinocytes in the epidermis. This rapid cell turnover also leads to parakeratosis, where nuclei remain in the upper layer of keratinocytes because of premature differentiation. Furthermore, psoriatic lesions often show a loss of the granular layer of the epidermis.

The hallmark symptoms of psoriasis are the development of scaly skin and increased epidermal proliferation. Treatments focus on managing this heightened proliferation, with Ki-67 serving as a critical marker to evaluate cell turnover. Ki-67 levels are significantly elevated in psoriatic skin, reflecting the rapid turnover of keratinocytes, and it is encoded by the MKI67 gene. Recent advancements allow for the quantification of the proliferation index through newly synthesized DNA using specific detectable probes. Another important marker, Cytokeratin-16 (CK-16), is found in the suprabasal layers of psoriatic skin, indicating abnormal hyperproliferation and differentiation, while it is absent in healthy skin. Psoriatic skin also uniquely expresses antimicrobial peptides, which set it apart from other inflammatory skin disorders.

In addition to keratinocytes, psoriatic lesions are characterized by a diverse array of immune cells, including dendritic cells, T and B lymphocytes, macrophages, plasma cells, and neutrophils. The main cytokines involved in the inflammatory response include IL-17, IL-22, IL-23, TNF-α, and IFN-γ. Psoriasis is associated with dysregulated immune responses from both the innate and adaptive systems, with strong evidence supporting both autoinflammatory and autoimmune mechanisms. Innate cell type 3 plays a crucial role in generating IL-17, which activates immune cells and promotes epidermal hyperplasia. The dysfunctional interaction of the IL-23 and IL-17 pathways, along with TNF-α, significantly worsens the psoriasis condition. However, the complex interactions between dermal cells and immune cells are still not fully understood but are essential for explaining the underlying mechanisms of psoriasis.

Various subsets of T cells, including TH1, TH2, TH9, TH17, TH22, and regulatory T cells, produce specific

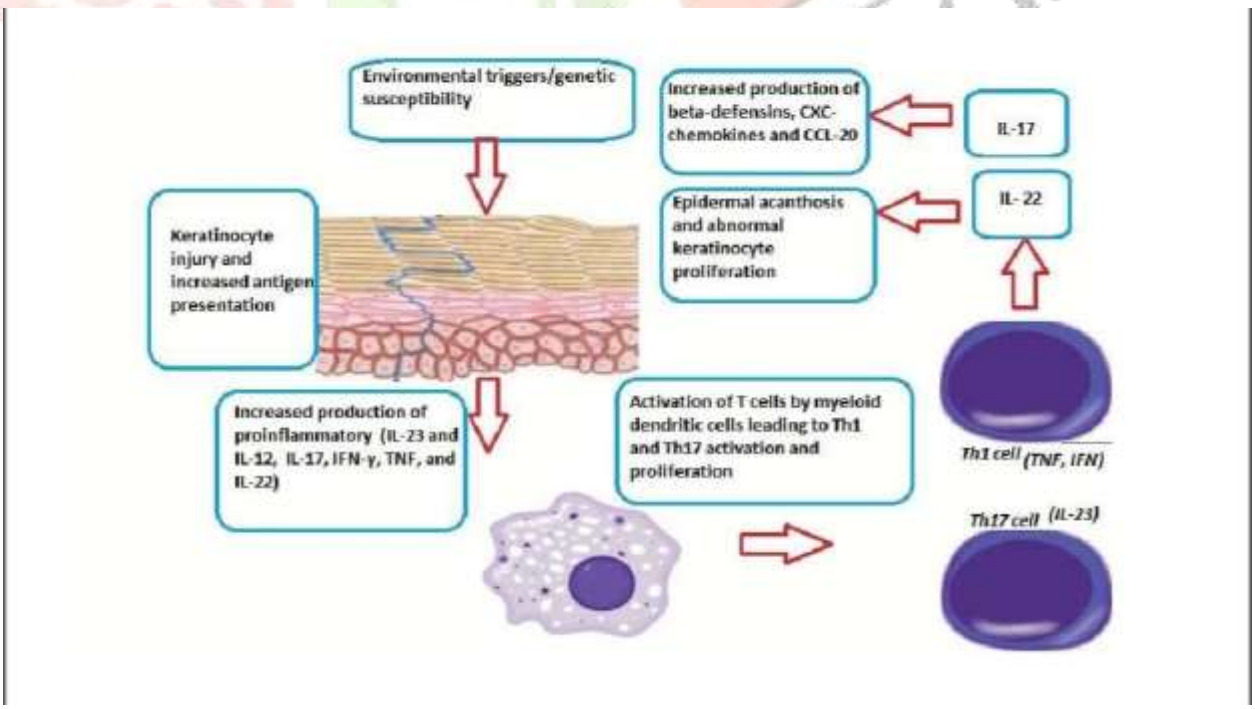


Fig no.3 Pathophysiology of Psoriasis

Common Signs and Symptoms of Psoriasis

Psoriasis can present a variety of signs and symptoms, including:

Patchy Rash: The rash's appearance can differ significantly among individuals, ranging from flaky patches resembling dandruff to large areas of eruption across the body.

Color Variations: Rashes can take on different colors, appearing as purple with gray scales on brown or Black skin, while showing pink or red with silver scales on white skin.

Small Scaling Spots: These tiny patches are commonly observed in children.

Dry, Cracked Skin: Affected areas may become dry and fissured, potentially leading to bleeding.

Itching, Burning, or Soreness: Many individuals experience discomfort in the affected regions.

Cyclic Rashes: The rashes may flare up for a few weeks or months, followed by periods of remission.

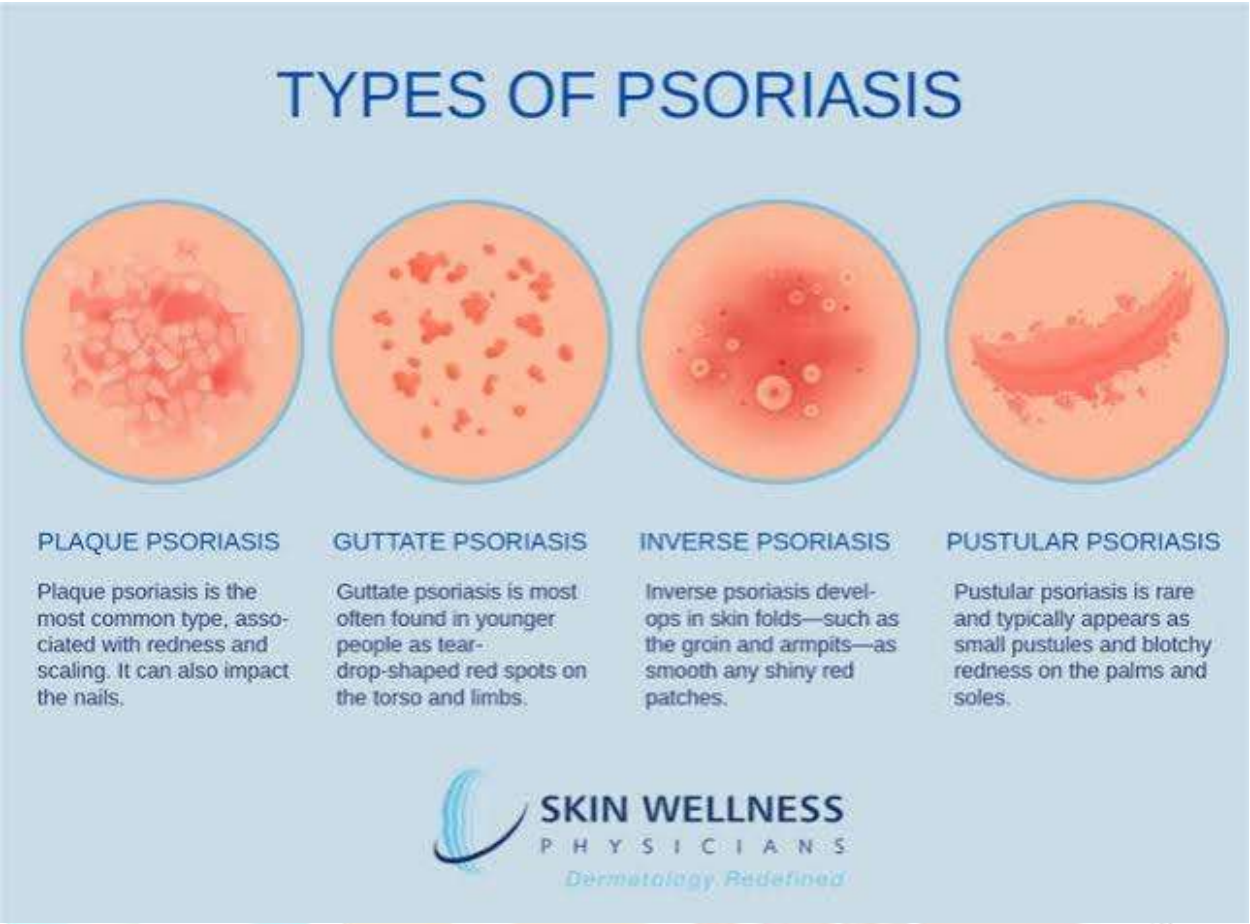


Fig no.4 types of psoriasis

Types of Psoriasis

There are several distinct types of psoriasis, each with unique signs and symptoms:

Plaque Psoriasis: This is the most common form, characterized by dry, itchy, raised patches (plaques) covered in scales. The number of plaques can vary, and they typically develop on areas such as the elbows, knees, lower back, and scalp. Their color may change based on the individual's skin tone, and healing may result in temporary color changes, particularly on brown or Black skin.

Nail Psoriasis: This type can affect the fingernails and toenails, leading to pitting, unusual nail growth, and discoloration. Nails may also loosen and separate from the nail bed (known as onycholysis), and severe cases can result in crumbling nails.

Guttate Psoriasis: Primarily affecting children and young adults, guttate psoriasis is often triggered by bacterial infections like strep throat. It features small, drop-shaped scaling spots on the trunk, arms, or legs.

Inverse Psoriasis: This form mainly affects skin folds, such as those in the groin, buttocks, and breasts. It presents as smooth patches of inflamed skin that can worsen due to friction and sweating, with fungal infections often acting as triggers.

Pustular Psoriasis: A rare type, pustular psoriasis leads to clearly defined pus-filled blisters and can appear in widespread areas or localized patches, especially on the palms or soles.

Erythrodermic Psoriasis: The least common type, erythrodermic psoriasis can cover the entire body with a peeling rash that can cause intense itching or burning. It may occur as an acute (short-term) or chronic (long-lasting) condition.

When to Consult a Doctor

If you suspect you have psoriasis, it's important to consult your healthcare provider. Seek medical attention if your condition

Causes of Psoriasis

Psoriasis is believed to be a disorder of the immune system that leads to an abnormal increase in the production of skin cells. In plaque psoriasis, the most common variant, this accelerated cell turnover results in dry, scaly patches on the skin. Although the precise cause of psoriasis remains unclear, it is thought to involve an immune system malfunction where cells intended to combat infections mistakenly attack healthy skin cells. Genetic factors and environmental influences are considered to play significant roles in the development of the condition, which is not contagious.

Triggers for Psoriasis

People predisposed to psoriasis may remain symptom-free for years until certain environmental factors provoke the condition. Common triggers include:

Diseases: Such as sore throat or skin diseases.

Weather: Especially in cold, dry climates.

Skin Injuries: This includes cuts, scrapes, insect bites, or severe sunburns.

Smoking: Including exposure to secondhand smoke.

Alcohol Consumption: Heavy drinking can increase the risk.

Medications: Some drugs, such as lithium, medications for high blood pressure, and antimalarial drugs, may trigger psoriasis.

Withdrawal from Corticosteroids: Rapid discontinuation of oral or injected corticosteroids.

Risk Factors

Anyone can develop psoriasis, with about one-third of cases beginning in childhood. Several factors can increase the likelihood of developing the disease, including:

Family History: Psoriasis often runs in families. Having one parent with the condition raises your risk, and this risk increases if both parents have psoriasis.

Smoking: Tobacco use not only heightens the risk of developing psoriasis but may also worsen its severity.

Complications Associated with Psoriasis

Individuals with psoriasis are at an elevated risk of developing various other health conditions, including:

Psoriatic Arthritis: This condition results in pain, stiffness, and swelling in and around the joints.

Temporary Changes in Skin Color: These may include post-inflammatory hypopigmentation or hyperpigmentation in areas where plaques have healed.

Eye diseases: Such as conjunctivitis, blepharitis and uveitis.

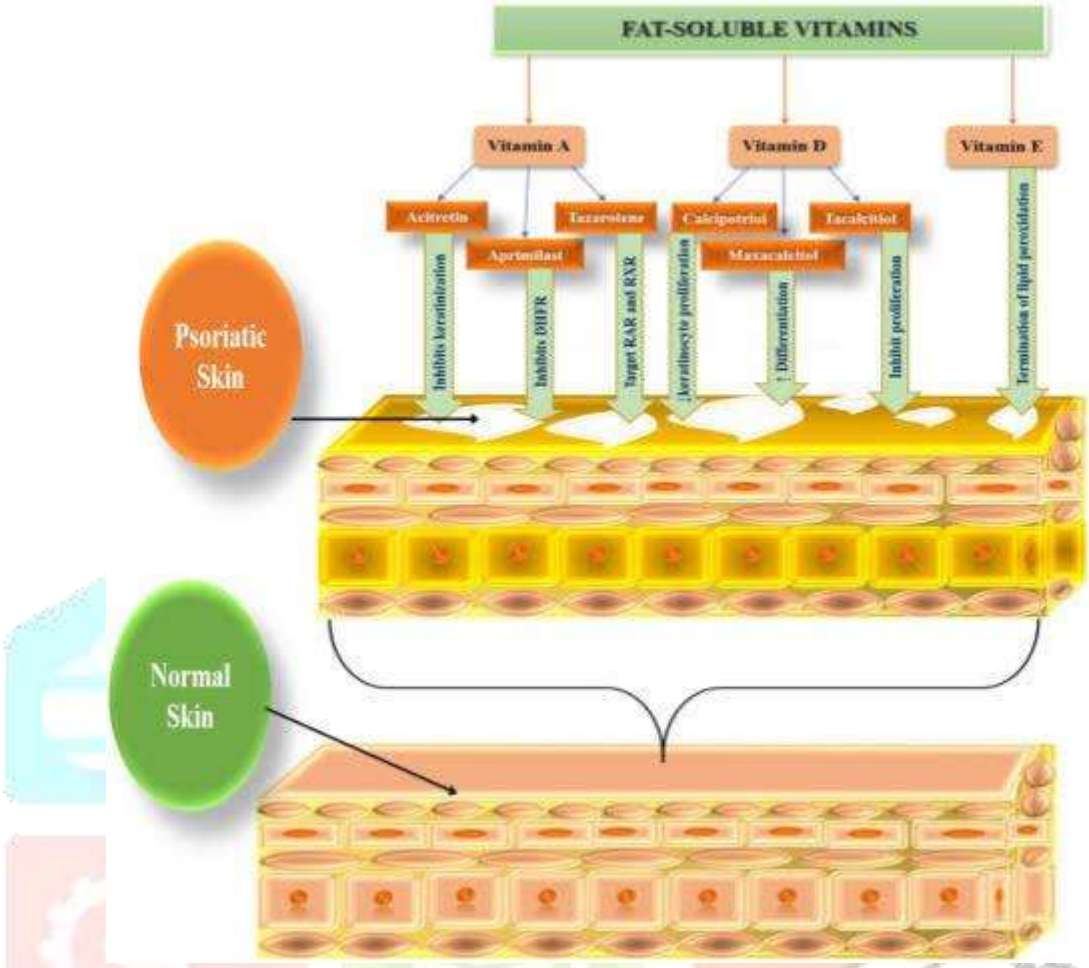
Obesity: Increased likelihood of obesity

3.1.1. **Vitamin A**

Vitamin A is a fat-soluble vitamin crucial for numerous metabolic and physiological processes. The use of vitamin A derivatives in psoriasis treatment has been extensively studied, with both topical and oral forms showing beneficial results for patients. However, the specific reason for vitamin A deficiency in individuals with psoriasis remains unclear, as levels of this vitamin are generally low in psoriatic skin lesions. Research conducted by Rollman and Vahlqvist found vitamin A deficiency to be common among 107 psoriasis patients when compared to 137 healthy controls. Many studies propose that psoriasis involves an altered metabolic pathway for retinol, characterized by increased production of retinoic acid in affected skin. Recent research by Wang et al. The use of mice as a psoriasis model highlights the need for more vitamin A in psoriatic skin.In psoriasis, the epidermis becomes thickened, and immune cells infiltrate the skin,It increases proinflammatory cytokines such as TNF-α, IL-17A and IL-23. Vitamin A plays a vital role in managing this condition. The body processes vitamin A in the form of retinol, which binds to Retinol Binding Protein 4 (RBP4) to create a complex known as holo-RBP4. This complex interacts with the membrane protein Stimulated by Retinoic Acid 6 (STRA6), allowing retinol to be delivered to target tissues, thus signaling skin cells to differentiate and proliferate. The metabolism of retinol involves several proteins, including Cellular Retinoic Acid Binding Proteins 1 and 2 (CRABP 1 and 2), Retinal Dehydrogenase (RDH), members of the CYP450 enzyme family, and Lecithin Retinol Acyltransferase (LRAT). While the relationship between metabolic syndrome and psoriasis remains poorly understood, adipocytokines are believed to significantly influence immune responses and inflammation related to the disease. Some studies suggest a link between RBP4 and STRA6 levels in psoriasis, as these proteins assist in redistributing retinol to affected tissues.

To manage moderate to severe psoriasis, drugs that inhibit TNF-α, interleukin IL 12/23, and more recently IL-17 have been employed. However, these treatments may increase the risk of serious fungal infections, such as Pneumocystis jirovecii pneumonia, candidiasis, and histoplasmosis. According to Picciani et al., 26% of psoriasis patients tested positive for oral candidiasis, whereas none of the healthy volunteers did.

Acitretin is a potent oral retinoic acid used to treat psoriasis. It is the principal metabolite of etretinate and has a significantly shorter half-life of 49 hours. Acitretin works by preventing the increased cell proliferation and keratinization characteristic of psoriasis, thus reducing skin thickening, plaque formation, and scaling. While the exact mechanism of action is not completely understood, it is thought to target specific receptors in the skin



(including retinoid receptors RAR and RXR) to help restore the normal growth cycle of skin cells. Acitretin is best absorbed when taken with

Fig no.5 Vitamin strategies for psoriasis

food at doses between 20 to 100 mg per day, achieving an absorption rate of about 72%. In a randomized open-label study involving 60 psoriasis patients, less than 30% of those on acitretin monotherapy achieved a 75% improvement in the Psoriasis Area and Severity Index (PASI 75) score. In contrast, patients who received combination therapy with entrapment therapy showed more significant improvements compared to those on acitretin alone. Although clinical trials primarily focused on chronic plaque psoriasis, acitretin has proven safe and effective for other psoriasis types as well.

Tazarotene, belonging to the acetylenic family of retinoids, is a prodrug utilized in topical formulations for conditions like photodamage, psoriasis, and acne. Although the precise mechanism of action for tazarotene is not fully understood, studies suggest that its active form, tazarotenic acid, binds to all three types of retinoic acid receptors (RARα, β, and γ) but shows a relative selectivity for RARβ and RARγ, which may modify gene expression. Tazarotene undergoes rapid conversion to its active metabolite upon absorption, resulting in minimal systemic absorption, and has a half-life of 18 hours in both healthy and psoriatic patients. A study by Samar Khalil et al. evaluated the effects of 0.05% and 0.1% tazarotene creams in a multicenter, double-blind, randomized trial with 1,303 patients over 12 weeks. Both concentrations demonstrated significant reductions in plaque severity

compared to placebo, with the 0.1% formulation yielding better results and minimal irritation. The authors concluded that 0.1% tazarotene cream is effective for treating psoriasis.

Summary

A study was conducted to evaluate the vitamin A status of 107 patients with psoriasis in comparison to 37 healthy controls. Mean serum retinol-binding protein (RBP) levels within the normal range in 79 patients with plaque psoriasis affecting 25% or less of the skin fold. Conversely, the 28 patients with more widespread lesions or pustular/erythrodermic psoriasis exhibited significantly lower mean serum RBP levels compared to the control group ($P<0.05$).

The study also analyzed retinol (vitamin A1), dehydroretinol (vitamin A2), and carotenoid levels in saponified shave-biopsy samples from both affected and unaffected skin in 33 patients with plaque psoriasis. The retinol levels were similar to those found in control skin (mean: 252 ng/g), while carotenoid levels in both types of skin were reduced by 25%–50%. Notably, dehydroretinol concentrations were significantly higher in the affected skin (mean: 237 ng/g) compared to the unaffected skin (94 ng/g) and healthy control skin (70 ng/g; $P<0.01$). Although the reason for the elevated dehydroretinol levels in the affected psoriatic skin is unclear, similar increases were noted in the epidermis of controls subjected to tape stripping, which induces proliferation.

In a subgroup of seven patients treated with oral etretinate (an aromatic retinoid) for 2–3 weeks, the median levels of retinol and dehydroretinol in affected skin rose by 107% and 212%, respectively, while vitamin A levels in unaffected skin remained stable. Furthermore, oral treatment with β-carotene/canthaxanthin led to increases in median carotenoid levels of 170% in unaffected skin and 610% in affected skin, without significantly impacting the vitamin A levels.

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21. Figures Availble on
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