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REVIEW

Dermatoses of chronic nature: new developments in diagnosis and treatment

Dermatosis de carácter crónico: nuevos avances en diagnóstico y tratamiento

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ABSTRACT

Introduction: chronic dermatoses significantly affect patients' lives, and global burden of skin diseases represents important public health challenge worldwide, with the phenomenon of a tendency towards increasing level of dermatological pathology.
Method: in the last two decades, there has been a significant breakthrough in improving methods and strategies for treating chronic dermatoses, with the emergence of relevant innovative technologies and drugs. At the same time, publications describing these innovations are scattered and narrowly focused, often lacking a systemic vision.
Results: with this in mind, the article aims at outlining the overall (integrative) landscape of contemporary paradigms, vision and approaches to the diagnosis and treatment of chronic dermatoses of various specifics and etiology. Based on the tools of scoping review, as well as general scientific methods of systematization and generalization, existing achievements and challenges in diagnosing and treatment of skin diseases such as atopic dermatitis, psoriasis, eczema, etc. were revealed and put together.
Conclusions: the findings demonstrate that, despite significant and evident, sometimes disruptive, advances in skin diseases diagnosis and treatment, such as AI and machine learning in diagnosis and biologic drugs in treatment (allowing customizing treatment to target specific immune pathways), there are still remaining challenges, which represent crucial frontiers for future research.

Keywords: Dermatovenereology; Eczema; Skin Diseases; Psoriasis; Pediatric Psoriasis; Atopic Dermatitis; Acne.

RESUMEN

Introducción: las dermatosis crónicas afectan significativamente a la vida de los pacientes, y la carga global de las enfermedades de la piel representa un importante reto para la salud pública en todo el mundo, con el fenómeno de una tendencia al aumento del nivel de patología dermatológica.
Método: en las últimas dos décadas, se ha producido un avance significativo en la mejora de los métodos y estrategias para el tratamiento de las dermatosis crónicas, con la aparición de tecnologías y fármacos innovadores relevantes. Al mismo tiempo, las publicaciones que describen estas innovaciones están dispersas y tienen un enfoque limitado, careciendo a menudo de una visión sistémica.
Resultados: teniendo esto en cuenta, el artículo pretende esbozar el panorama general (integrador) de los paradigmas contemporáneos, la visión y los enfoques para el diagnóstico y tratamiento de las dermatosis crónicas de diversas especificidades y etiología. Basándose en las herramientas de la revisión de alcance, así como en métodos científicos generales de sistematización y generalización, se revelaron y pusieron en común los logros y retos existentes en el diagnóstico y tratamiento de enfermedades cutáneas como la

dermatitis atópica, la psoriasis, el eccema, etc.
Conclusiones: los hallazgos demuestran que, a pesar de los avances significativos y evidentes, a veces disruptivos, en el diagnóstico y tratamiento de las enfermedades de la piel, como la IA y el aprendizaje automático en el diagnóstico y los fármacos biológicos en el tratamiento (que permiten personalizar el tratamiento para dirigirse a vías inmunitarias específicas), aún quedan desafíos pendientes, que representan fronteras cruciales para la investigación futura.

Palabras clave: Dermatovenereología; Eczema; Enfermedades de la Piel; Psoriasis; Psoriasis Pediátrica; Dermatitis Atópica; Acné.

INTRODUCTION

The global burden of skin disorders affects more than 3 billion people, creating significant public health issues in both high- and low-income nations.[1] These difficulties are worsened by broad discrepancies in access to dermatological treatment and the prevalence of misinformation.

In current times, there is a trend towards a growth in dermatological pathology, which is driven by negative changes in environmental and socioeconomic variables, as well as enhanced diagnostics. Atopic dermatitis, eczema, and psoriasis account for 50 to 80 % of chronic dermatoses, which are distinguished by a long and often severe course with frequent relapses, as well as low efficacy of traditional therapy, including in pediatrics (particularly pediatric psoriasis).[2] Li et al.[2] also point out that the lack of information about the global epidemiology and temporal trends of viral skin diseases presents major obstacles to their management and control, emphasizing the necessity of ongoing monitoring and specialized treatments to control and lessen the consequences of these illnesses.

Among the most often skin diseases conditions, there is, in particular, eczema. According to the definition by National Cancer Institute (USA), eczema is a group of skin disorders characterized by inflammation, blistering, and thick, scaly, crusty skin. Eczema can last for a long time and is characterized by burning and itching. The most prevalent kind of eczema is called atopic dermatitis.[3]

Another common skin disease is psoriasis. Psoriasis is a chronic (long-lasting) condition where skin cells proliferate too quickly due to an overactive immune system. The scalp, elbows, or knees are the most common areas where scaly, inflammatory skin patches appear, although other body parts may also be impacted.[4]

In order to give a current assessment of the burden of skin illness, the American Academy of Dermatology started a study back in 2016 that examined the impact of skin disease on the patient population in the United States. Using 2013 healthcare claims data from insurance enrollment and claims data, the study looked at the prevalence, financial burdens, and mortality of skin diseases in the US and discovered that:[5]

- Skin disease affected 84,5 million Americans, or one in four
- The expenditures of treating, preventing, and prescribing and non-prescription medications for skin disease were $75 billion for the US healthcare system.
- Dermatologists treat one in three Americans with skin conditions; they work with other medical professionals across the healthcare system to provide these patients with care.

The most prevalent skin conditions in the world, dermatitis and psoriasis, have been negatively impacting patients' everyday lives by lowering their quality of life and causing them to suffer physically. Race and geographic location have an impact on the prevalence of psoriasis. Nonetheless, psoriasis is more prevalent in Western nations and among individuals of European heritage, such as in France (4,42 %), Norway (4,6 %), Portugal (4,4 %), and the US (3,0 %). The prevalence of psoriasis is much greater in several Western nations than it is worldwide (57,8 instances per 100 000 population): Italy (230,62), Denmark (199,5), and Israel (280). Psoriasis exhibits a bimodal pattern of expression, with early (type I) and late (type II) start, occurring between the ages of 30 and 40 and around 60.[6] Furthermore, the cost of treating psoriasis sufferers is high for both the government and the individuals who have the condition.

According to Ukrainian scientists in the field of pediatric dermatology, about 14 % of patients develop psoriasis before the age of 9, and in most cases the onset of the disease occurs between the ages of 5 and 15, which confirms the epidemiological significance of the disease in childhood. Data on the prevalence of psoriasis in Ukraine differ significantly from the average rates in Europe and in different countries of the world. According to experts, the actual percentage of this disease is much higher, since according to unofficial data, more than 3 % of the population in Ukraine suffers from psoriasis.[7]

The clinical, economic, and societal relevance of the problem, as well as the resolution of scientific concerns, dictate the necessity for this study. Skin and venereal diseases are constantly developing, as are the knowledge and procedures used to prevent, diagnose, and treat them. Advancements are being developed that have the potential to significantly affect the continuing global effort to enhance skin health. Allowing these

developments to be confirmed and ensuring that all doctors follow best practices would ultimately propel dermatology and venereology ahead. In this vein, the article aims at outlining the overall (integrative) landscape of contemporary paradigms, vision, and approaches to the diagnosis and treatment of chronic dermatoses of various specifics and etiology.

LITERATURE REVIEW

2 058 patients with 1 137 cases of psoriasis (PS), 413 cases of atopic dermatitis (AD), 301 cases of hidradenitis suppurativa (HS), and 207 cases of chronic urticaria (CU) from 24 sites were included in a research by Becherel et al.[8] Of these, 108 patients decreased the dosage of their current systemic treatment, while 1 950 patients began or modified systemic treatment. The disease's impact on everyday, familial, and professional life was deemed detrimental by 90,5 % (HS), 80,1 % (PS), 89,4 % (CU), and 90,5 % (AD). The SF-12 Survey found that the effects of all four disorders were severe for mental health and borderline pathological for physical health. Twenty-four percent of patients were on a traditional systemic or biologic medication at the time of inclusion. It increased to 83,3 % after the initial visit. 17,7 % (PS), 27,9 % (AD), 43,1 % (HS), and 43,6 % (CU) of patients lost work because of their illness during the six months before to study participation, and 26,3 % of patients with HS had been hospitalized to the hospital (compared to 8,1 %, 5,8 %, and 13 % of patients with PS, AD, or CU, respectively).[6]

Atopic dermatitis is categorized as a severe dermatosis in terms of the severity of its clinical symptoms and prognosis, and it can occasionally result in disability.[9] Researchers found that children with moderate and severe types of atopic dermatitis have considerably lower quality of life indicators and direct expenses than a similar group of kids with type 1 diabetes.[10] According to a comparative analysis of the effects of different diseases on patient quality of life indicators, atopic dermatitis and psoriasis have the biggest effects among all chronic skin diseases; only cerebral palsy was found to have a greater effect on quality of life when compared to the effects of other diseases.[11]

According to WHO,[12] skin diseases are a global public health priority because of the 4,69 billion incident cases of skin and subcutaneous diseases found in the Global Burden of Disease Study 2021, which resulted in 41,9 million disability-adjusted life years (DALYs) and made up one of the top 10 causes of disability.

Numerous researchers have conducted numerous studies and put forth novel treatment approaches, including as cell transplantation, biological products, and small-molecule targeted medications, in an effort to alter this state of affairs. These innovative treatments create the path for future dermatological medical care while also creating new opportunities to enhance patients' quality of life. With the aim of establishing a scientific foundation for future dermatitis and psoriasis treatment strategies, a thorough examination and synopsis of these innovative approaches not only would enable comprehension of the benefits and drawbacks of each approach but also would allow identifying the factors influencing the therapeutic impact.[13]

Tong et al.[14] note that a sound percentage of chronic inflammatory dermatoses include psoriasis, seborrheic dermatitis, atopic dermatitis, irritant contact dermatitis, rosacea, allergic contact dermatitis. The authors contend that the primary clinical diagnosis of AD is made through a patient's medical history and physical examination. The American Academy of Dermatology criteria, the UK Working Party's Diagnostic Criteria, and the 1980 Hanifin and Rajka criteria are among the available diagnostic standards.[14] The Eczema Area and Severity Index (EASI) and the SCORing AD (SCORAD) index can be used to evaluate the severity of the disease. A number of illnesses should be checked out because they appear similarly to AD. These include diseases including cutaneous T-cell lymphoma, psoriasis, seborrheic dermatitis, and allergic/irritant contact dermatitis.[15] Although there isn't a suggested testing schedule for AD diagnosis or therapy, physicians might ask for histologic confirmation. Despite the fact that AD is frequently an IgE-mediated illness, it is not advised to measure blood IgE levels because this test is nonspecific. Avoiding aggravating factors, restoring the skin barrier, and treating skin inflammation with medication are the main objectives of AD care.[15,16] First-line treatment for mild to moderate AD involves barrier protection with topical emollients (such as lotions, creams, and ointments) and topical corticosteroids (TCSs), such as clobetasol and triamcinolone. Topical drugs that inhibit calcineurin (e.g, tacrolimus and pimecrolimus), phosphodiesterase 4 (crisaborole), JAK (ruxolitinib), and an aryl hydrocarbon receptor agonist (tapinarof) are examples of alternative medicines.[17] These products are especially helpful for sensitive regions (such as the face and genitalia) that are susceptible to skin atrophy as a result of using strong topical steroids. Treatments include phototherapy, biologic medicines, and JAK inhibitors may be taken into consideration for moderate to severe illness.

In the United States, there are now two biologic medicines that have received FDA approval. The first biological drug authorized by the FDA for the treatment of AD was dupilumab, a monoclonal antibody targeting the alpha receptor of the interleukin-4 (IL-4) (shared by the receptors for IL-4 and IL-13).[18] It is given by subcutaneous injection and is authorized for use in adults and children six months of age and up. Adults and children 12 years of age and up can be treated for AD with Tralokinumab, which targets IL-13.[19] Lebrikizumab, which likewise targets IL-13, may soon receive US approval for AD.[20] Japan has authorized nemolizumab, another novel biologic, to treat AD.[21] It targets IL-31 and is presently being reviewed by the FDA for the treatment of AD in the US.

For psoriasis or dermatitis, medicine has historically concentrated on three primary therapeutic modalities:

phototherapy, systemic therapy, and local therapy.[22] The only objectives of treatment are to alleviate the condition, enhance the quality of the skin, and postpone its progression. For mild to severe cases of dermatitis and psoriasis, local therapy is typically the first line of treatment. Topical creams are drugs that mainly inhibit inflammation and cell proliferation, such as corticosteroids, vitamin D derivatives, and tar-like substances. Although topical therapies have fewer negative effects, prolonged usage may result in severe skin atrophy or unpleasant discomfort. For moderate to severe cases, systemic therapy is required. Systemic medications including methotrexate, cyclosporine, and acitretin primarily inhibit immune system function and lessen an overactive immune response. These systemic medications can significantly alleviate symptoms, but long-term use can cause major adverse effects and damage to important organs like as the liver and kidney, therefore therapy should be chosen carefully and under the supervision of a specialist. Another traditional treatment method is phototherapy, involving exposing the afflicted region to UV light to inhibit cell proliferation and inflammation. This treatment is often applied to treat moderate to severe psoriasis and dermatitis, and it manifests particular success in individuals who have not responded to local or systemic medications.[10] At the same time, phototherapy may raise the risk of skin cancer, and thus it should be used with caution.

Within the array of innovative treatment techniques, biologic medications have demonstrated sound performance in the therapy of psoriasis and dermatitis.[23] This class of medications is mostly based on biotechnology for manufacturing pharmaceuticals such as monoclonal antibodies and fusion proteins. These medications can be used to change disease-associated biological markers or immunological pathways, hence adjusting the body's immune response. Biologic medicines are capable of treating psoriasis due to mechanism of suppressing certain cytokines or receptors such as TNF-α, IL-17, and IL-23, which limit the pathogenic immune response. These medications include etanercept, adalimumab, secukinumab, and guselkumab. Following several clinical trials, the functional performance of these biologic medicines is outstanding. They can not only dramatically improve the pathology of psoriasis skin lesions, but also limit the number of disease recurrences to some amount, therefore significantly increasing patients' quality of life.[24] Biologic products have also shown promising results in the treatment of dermatitis. Biologic medicines have a strong inflammatory remission impact on atopic dermatitis and other disorders caused by immune system overreactions by intervening in similar cytokine pathways. Drugs like dupilumab, which targets IL-4 and IL-13, are successful at reducing skin lesions and itching, and they are safer than standard immunosuppressants.[25]

Diagnosis is sometimes a hurdle. Immune dysregulation, in particular, causes distinctive epidermal alterations that may be detected both visually and histologically. Both Alzheimer's disease and psoriasis exhibit enhanced epidermal growth. Psoriasis histology will also show hyperparakeratosis, uneven acanthosis with elongated rete ridges, and tortuous vasculature. In contrast, AD has consistent hyperkeratosis and uneven acanthosis. In Alzheimer's disease, the vasculature is likewise dilated, but no new angiogenesis occurs. It is worth noting that AD and contact dermatitis have comparable histologic results, making them difficult to identify. Rosacea causes significant epidermal changes on the face, such as erythema and visible vascular alterations. SD has greasy scales and erythematous plaques. Pruritus is a prevalent symptom of all inflammatory cutaneous diseases, caused by cytokine release and nerve sensitization.

When discussing diagnostic problems, it is worth noting that individuals with chronic hand eczema (CHE) might present with several subtypes, each with its own immunological signature.[26] Chronic hand eczema is frequently complex, and the link between clinical patterns and etiological diagnosis is seldom straightforward. Mixed subtypes may exist, containing more than one etiological and morphological subtype. Furthermore, there is no consistent relationship between morphology and etiology; etiology cannot be determined just by the look of the hands.[27] Topical corticosteroids (TCSs) are now suggested as the primary short-term therapy for persistent hand eczema. However, their effectiveness in long-term intermittent usage is limited, and TCSs have been linked to adverse effects.[28] Additionally, medications aimed at the type 2 immune response may not be successful in all CHE subtypes. Clearly, there is a large unmet need for an FDA-approved medication designed particularly for chronic hand eczema that is well tolerated over time and efficacious across all subtypes.

Atopic dermatitis, as well as psoriasis, are common skin disorders that afflict many children, with each caused by a different immunological mechanism. Psoriasis is defined by the activation of the Th17/IL-17/IL-23 axis, which causes rapid skin cell proliferation and the production of thick, scaly plaques. On the contrary, atopic dermatitis is predominantly caused by the Th2/IL-4/IL-13 pathway, which causes severe itching and breakdown of the skin's natural barrier. The overlapping symptoms and unusual presentatioe ns of these illnesses in children frequently confound diagnosis and therapy.[29]

Chronic inflammation determines the frequent choice of topical or systemic anti-inflammatory medications for the first-line therapy of all inflammatory dermatoses. However, the particular treatment options are differentiated, depending of the patient' condition. While the inflammatory disorders have many commonalities, still the underlying immunological processes and approaches to targeted therapy differ. Understanding the distinctions between these cutaneous disorders is critical for effective managing and treating. Continued study and investigation of the overlapping immunological pathways would improve the development of future medicines and contribute to better patient outcomes, particularly in those with multiple chronic inflammatory

dermatoses.

Psoriasis represents a chronic inflammatory disease, mostly affecting the skin and joints. Except the disease' physical aspects, it also has a significant emotional and mental impact on patients suffered with it, impairing social functioning and interpersonal ties and communication. Psoriasis, being a systemic inflammatory disease, is linked to a range of comorbidities, including cardiovascular disease and cancer. The diagnosis is mostly clinical, and a skin biopsy is rarely necessary. Depending on the severity, proper therapy can begin. First-line treatment for mild to moderate condition consists of topical medicines such as corticosteroids, vitamin D3 mimics, and combination solutions. These topical therapies give good results and may be safely prescribed by primary care providers. Patients with severe and refractory symptoms may require additional examination by a dermatologist for systemic treatment.

Within decades, the treatment of chronic inflammatory dermatoses implied standard systemic immunosuppressive and immunomodulatory agents. Cyclosporine A, methotrexate (MTX), dapsone, and glucocorticosteroids (GCs) were used as the primary treatment options, offering symptomatic relief to many patients. These drugs have wide immunosuppressive effects, which can help regulate inflammation.[30] In particular, MTX, a folate antagonist, inhibits dihydrofolate reductase and lowers immune cell and keratinocyte proliferation, which makes it an effective treatment for psoriasis. Among patients for whom MTX was applied for 12-16 weeks, 60-70 % demonstrated a 75 % improvement in the Psoriasis Area and Severity Index (PASI 75).[31] Similarly, cyclosporine A, a calcineurin inhibitor, reduces T-cell activation and cytokine production, resulting in fast disease management. It has efficiently cured moderate-to-severe instances of Alzheimer's disease and psoriasis.[32] GCs are still widely used to treat a variety of chronic inflammatory dermatoses, in particular, psoriasis and atopic dermatitis. Their broad-spectrum anti-inflammatory actions provide quick symptom alleviation, making them essential for acute flares.

Meanwhile, one should note that, despite their widespread usage, these drugs are not without negative effects. Since they have nonspecific nature, they can weaken the immune system, increasing the risk of infections and cancer. Moreover, their efficacy varies, with many patients manifesting only partial responses or even failure of therapy as such. Also, the chronic nature of many conditions determines the necessity of long-term treatment, which can contribute to cumulative toxic effect. In particular, chronic use of cyclosporine A relates to nephrotoxicity and hypertension, whereas MTX can cause hepatotoxicity and bone marrow suppression.[33] While GCs are very successful in the short term, their prolonged usage can cause systemic adverse effects such as osteoporosis, hyperglycemia, and adrenal suppression.[34] Thus, an increasing demand exists for more focused medicines with higher efficacy and better safety profile. Nevertheless, the emergence of biological treatments had transformative effect on the management of chronic inflammatory dermatoses by providing a more tailored approach to therapy. According to the regional analysis of skin diseases treatment market (MMR, 2024), North America demonstrates the largest market share for skin disease treatment and likely will further dominate during the forecast period. Following this tendency, Europe is also likely to continue to lead the worldwide skin disease treatment market in the near future. Technological advancements, as well as the availability of cutting-edge goods and equipment for skin disease treatment, are significant drivers driving market demand in these areas. APAC is also predicted to develop rapidly in the next years due to increased awareness, a large population base, and continued technology improvements. Growing medical tourism in India, Thailand, South Korea, Singapore, and Malaysia has increased global demand for skin disease treatments. The global ski illness treatment market is estimated to increase at a 3,67 % CAGR in the period of 2023 and 2030, from USD 3,80 billion in 2024 to USD 4,89 billion in 2030.[35] Skin diseases treatment market by product type is depicted in figure 1.

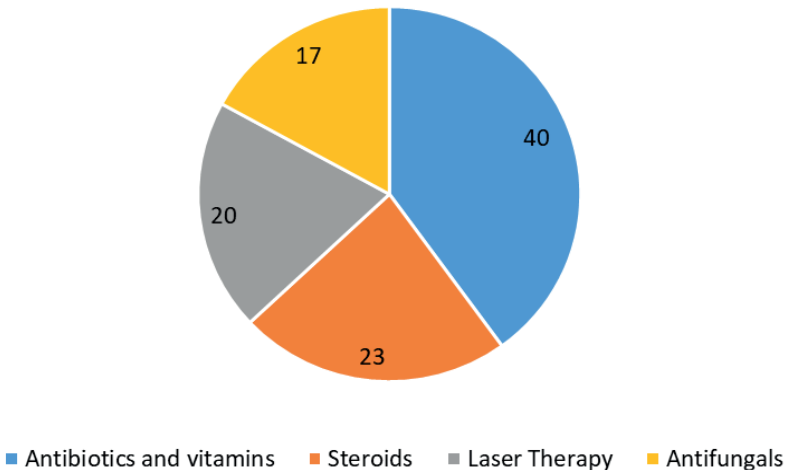

Figure 1. Skin Diseases Treatment Market, by product type (in %)
Source: MMR [35]

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Overall, skin illnesses are among the most common health issues globally, affecting people of all ages, races, and socioeconomic backgrounds. These illnesses vary from basic difficulties like acne and cutaneous infections (including sexually transmitted diseases) to chronic skin ulcers, immune-mediated inflammatory disorders, and oncological challenges (such as melanoma and other skin malignancies). Despite their prevalence and significant impact, skin disorders are underrepresented in public health discourse and healthcare policy. Patients frequently report a worse quality of life, social shame, and severe financial burden, while systemic comorbidities such as metabolic, cardiovascular, and mental health issues exacerbate the impact of these conditions on overall patient well-being.

METHOD

The research is based on scoping review, which allowed effectively mapping existing literature on the topic under consideration. Scoping review with the transparent methods of its conduct enabled ensuring that the results are trustworthy.

Comprehensive literature search was carried out using electronic online databases PubMed, MDPI, and Google Scholar. Articles published since 2014 in English language were included for the sample for review. The preference was given to articles published after 2020, that is, in a five years period. The search for statistical data was also carried out in the array of reports devoted to healthcare market, to reveal the overall worldwide (paradigm-like) preferences in using of the kinds of therapy in treatment of skin diseases. Statistics presented on the official WHO website was also analyzed.

In total, the sample included 50 sources, among which 48 are specialized scholarly articles and two are reports. The process of searching and selecting literature sources is depicted in figure 2 below.

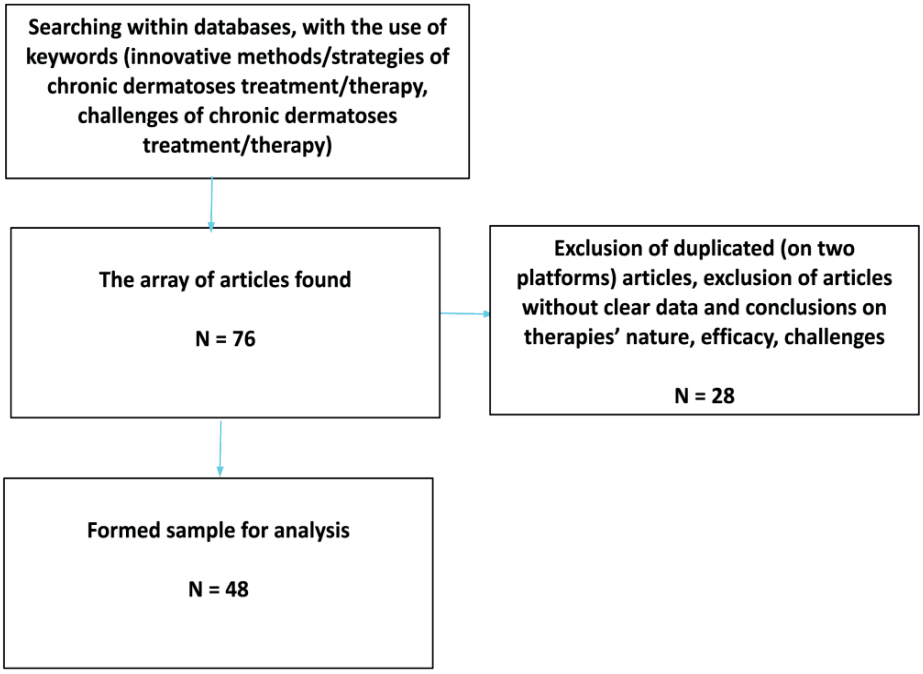

Figure 2. The process of sample formation

Statistical reports of WHO and market analytics were searched separately on WHO website and Google search platform accordingly.

General scientific methods were employed for analysis of selected literature sources: systemic method, systematization and generalization.

RESULTS AND DISCUSSION

Dermatological illnesses are diagnosed largely by clinical examination and histology. However, clinical signs alone may not be adequate for a correct diagnosis, and skin biopsies are linked with morbidity. As demonstrated in Jartarkar et al.'s [36] study, tremendous progress has lately been made in dermatologic diagnostic procedures and imaging technologies, each with advantages and limits. AI and ML software may have a significant impact on dermatological practice. In atopic dermatitis, an artificial neural network is utilized to identify between atopic and unaffected skin using data from an image database. In 2015, De Guzman et al.[37] revealed how to create a multi-model, multilayer artificial neural network for detecting eczema skin lesions. The algorithm can utilize

clinical pictures, dermoscopic images, and histological images to provide an accurate diagnosis. Esteva et al.[38] revealed their findings on skin cancer categorization using a deep convoluted neural network (CNN). In this work, they trained a dataset of 129 450 clinical photos and compared it to dermatologists' diagnoses of biopsy-proven clinical images. They demonstrated that CNN performed similarly to the professionals participated in the research.

Furthermore, AI's uses go beyond diagnosis. Teledermatology platforms using AI have improved access to care, especially in poor regions. During the COVID-19 epidemic, these technologies were critical in ensuring patient care, expediting triage, and enabling remote consultations. AI is also being used in science, where it speeds the processing of large datasets and aids drug development.

Dermoscopy (also known as an epiluminescence microscope and a dermatologist's stethoscope) has provided an excellent diagnostic tool for aiding in clinical diagnosis in inflammatory dermatoses. The primary premise is to illuminate and transilluminate a lesion in order to better visualize subtle surface and underlying features. The most recent generation dermoscopes have built-in crossed polarizers, which serve to filter out peripheral scattered light, minimize glare, and aid in the vision of substratal structure in the absence of linking fluid.[39] The current generation of dermoscopes has built-in photography and software for capturing, storing, and analyzing images. Advanced equipment include whole-body mapping systems, which aid in extensive studies and follow-up. The preservation and archiving of those photographs becomes increasingly convenient and useful when they interact with cellphones. Though clinicopathological correlation remains the primary method of diagnosis, dermoscopy is often useful in clinical differentials since it identifies unique patterns. Dermoscopy has become more commonly used in the treatment of general dermatological problems such as pigmentary dermatosis, inflammatory dermatosis, infectious dermatosis, and hair, scalp, and nail disorders in recent years. Specific indications are described by words such as pigmentaroscopy for pigmented lesions, trichoscopy of the scalp and hair, onychoscopy of the nails, inflammoscopy for inflammatory dermatosis and lesions, and entomodermoscopy for skin infestations and infections.

Moreover, optical coherence tomography (OCT) is growing popularity and is widely used in dermatological research. Epidermal thickness is a significant dermatological metric that may be deduced from an OCT picture and used to diagnose skin disorders. The second crucial parameter is optical resolution, which sets a lower limit on the spatial detail of skin structures.30 OCT is real-time and can take images in less than a minute. Here, the echo time delay and intensity of backscattered light from tissue microstructures are assessed. Longer wavelengths provide for greater viewing of deeper structures, whereas shorter wavelengths give higher resolution. OCT can track the course of inflammatory, viral, and blistering dermatoses.

Multispectral optoacoustic tomography may also be beneficial for early noninvasive psoriatic arthritis diagnosis. Li et al.[40] described the application of multispectral Raster-Scanning Optoacoustic Mesoscopy (ms-RSOM) to non-invasively image lesional and non-lesional skin areas on AD patients with varying severities in order to clarify structural features and functional information. This was done carried out for further exploring the balance between the impairment of the epidermal barrier and intrinsic immune dysregulation in AD. The authors used oxygen saturation (δsO2) levels in microvasculature, as well as other structural parameters like epidermis thickness (δET) and total blood volume (δTBV), to objectively assess AD severity between lesional and non-lesional skin areas. They found an upward trend in δsO2 and δTBV, which associated with the subjective clinical Scoring Atopic Dermatitis (SCORAD) for assessing severity.[40] δET decreased with AD severity, showing a decrease in the difference in epidermal thickness between lesional and non-lesional areas of the skin.

Dermatology is experiencing fast growth in innovative trends and breakthroughs targeted at improving patient outcomes and broadening treatment opportunities. Biologic medications, which are generated from living organisms, find increased application in treating chronic skin disorders such as psoriasis and atopic dermatitis.

In 1998, the FDA authorized the first biologic for dermatological therapy – etanercept, a TNF-α inhibitor monoclonal antibody for psoriasis. This, in fact, started a new era in dermatology, in which treatments could be tailored to individual immunological pathways. Since then, the 'arsenal' of biologics has grown dramatically, providing focused therapeutic choices that affect certain immune response' elements.

TNF-α inhibitors, such as infliximab, etanercept, and adalimumab, demonstrated effectiveness in treatment of psoriasis by clearing lesions quickly and consistently.[41] Ustekinumab, an IL-12/23 inhibitor, expanded the therapeutic choices by providing a different mode of action with a better safety profile. More recently, IL-17 inhibitors (secukinumab, bimekizumab, and ixekizumab) and IL-23 inhibitors (tildrakizumab and guselkumab) provided even higher success, with some patients experiencing total or near-complete skin clearance.[42]

The approval of dupilumab, an IL-4 receptor alpha antagonist, represents a big step forward in the treatment of Alzheimer's disease. Dupilumab inhibits the signaling of both IL-4 and IL-13, cytokines that play critical roles in the Th2-mediated immune response associated with Alzheimer's disease.[43] Additionally, clinical studies and real-world data have revealed that dupilumab considerably improves skin clearance and lowers pruritus, with better safety profile in comparison to systemic therapy from traditional 'spectrum'. Recently, lebrikizumab

and tralokinumab, two biologics that target IL-13 inhibitors, were authorized for treating adult patients with moderate and severe AD. According to clinical studies, patients' quality of life considerably improved, and the intensity of their pruritus and AD significantly decreased.[44]

In 2015, adalimumab, a TNF-α inhibitor, became the first FDA-approved biologic for moderate and severe instances of hidradenitis suppurativa – a disorder resistant to therapy.[40] Although adalimumab is beneficial in many patients, not always there was noticeable improvement, and adalimumab' effectiveness still varies.[45] Kimball et al.[46] believe that an important turning benchmark in the treatment of HS was the FDA's approval of secukinumab (an IL-17A inhibitor) and bimekizumab (a dual IL-17A and IL-17F inhibitor). Both medications have shown encouraging outcomes in clinical studies, providing a new degree of effectiveness in lowering HS-related pain and inflammatory lesions. These approvals, in fact, indicate growth in gradual comprehension of IL-17' leading role the pathophysiology of this disease and are a noticeable step in offering patients more efficient and specialized therapy choices.

Meanwhile, biologics demonstrated little effectiveness in treating alopecia areata, which is often treated with corticosteroids. The discovery of Janus kinase (JAK) inhibitors for the treatment of AA was another noteworthy advancement. According to Jabbari et al.[47], tofacitinib, the first JAK inhibitor authorized by the FDA for use in dermatology, demonstrated evident potential in the treatment of moderate-to-severe AA. Since then, other JAK inhibitors were authorized for the treatment of moderate-to-severe AA – these include ruxolitinib, baricitinib, and ritlecitinib.[48]

JAK inhibitors demonstrated effectiveness also in other chronic inflammatory dermatoses. In particular, baricitinib, licensed for the treatment of moderate-to-severe atopic dermatitis, provides patients with an additional targeted choice. Research on the potential of JAK inhibitors use in cases of psoriasis and HA is still underway, demonstrating that their potential goes beyond present indications.[49]

The focus is evidently shifting toward targeted therapy. For guiding treatment choices, it will be essential to identify biomarkers capable of predicting long-term outcomes, treatment success, and the severity of the disease. The ultimate objective is to customize care according to each patient's unique profile, which may involve environmental, immunological, and genetic variables.

New treatment targets may be discovered as a result of ongoing study on the molecular mechanisms underlying the pathophysiology of these diseases. In particular, investigating the mechanism of the microbiome' contribution to skin disorders may result in new treatments that alter the microbial habitat of the skin. The treatment choices will also be further expanded by developments in gene therapy and the use of biologics targeting new pathways including IL-17, IL-23, and IL-31.

One can expect that long-term research will enhance the safety and effectiveness of already available biologics and JAK inhibitors, offering guidance on the best dosage schedules and combination of treatments. With the increasing usage of these medications, it is also crucial to trace uncommon adverse effects and create plans to address treatment resistance that may arise from prolonged use.

Over the decade, dermatology has experienced sound breakthroughs thanks to developments in technology, therapies, and a better comprehension of the social demands of various groups. Table 1 summarizes the most evident achievements and remained challenges in dermatology during the last decade.

Table 1. Summary of achievements and remained challenges in dermatology within the last decade

Achievements	Remained challenges
Tremendous improvement of therapeutic efficacy in chronic inflammatory skin diseases and dermatoveneorology (e.g, atopic dermatitis, eczema, psoriasis, pediatric psoriasis, acne, etc.) with advancements in anti-cytokine antibodies (anti-IL-23, IL-17, IL-36), JAK inhibitors, and B-cell depletion therapies (anti-CD20)	The majority of patients need ongoing treatment, and true disease modification or cure is still elusive. Chronic inflammatory skin illnesses are becoming more commonplace worldwide, mostly due to poorly understood environmental and lifestyle drivers
AI systems capable of precisely classifying most skin diseases based on lesion morphology showed diagnostic accuracy rivalling dermatologists	Due to legal, regulatory, and ethical issues, as well as inadequate integration into healthcare procedures, AI application is still limited. More development and physicians acceptance are needed for using all the potential of AI-driven diagnostic tools
Recognition full-spectrum light exposure' (visible light, ultraviolet, infrared) the health benefits - in particular, its roles in the synthesis of vitamin D, immune modulation, and potential tissue repair via photobiomodulation	Utilization of photobiomodulation remains quite limited, with insufficient technological integration and a lack of standardized protocols. In public health guidelines, lacking of awareness of balanced UV exposure is still observed
More widespread adoption of equity, diversity, and inclusion (EDI) principles caused greater recognition of skin diseases relevant to populations with skin of colour	In underdeveloped countries, dermatology still experiences low funding and lack of proper research, leaving significant gaps in addressing infectious and neglected skin diseases that dominate morbidity and mortality in these regions

Source: Gniadecki [50]

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Dermatology has experienced a paradigm shift from managing symptoms to attaining long-lasting remission and wider systemic health benefits, despite some remaining challenges. In particular, the development of monoclonal antibodies, selectively targeting important cytokines (including IL-17, IL-23, and IL-36), transformed the treatment of psoriasis.[51] These biologic treatments demonstrated strong safety profiles and previously unheard-of skin clearance rates. Notably, monoclonal antibodies targeting inflammation associated with psoriasis showed additional systemic advantages, in particular increased overall survival. The decrease in cardiovascular comorbidities and systemic inflammation most likely mediates this impact.[52] These findings are revolutionary because they reshape our knowledge of the systemic impact of excellent dermatologic treatment by indicating that the benefits of treating chronic inflammatory skin illnesses go much beyond improvements in the appearance of skin.

The success of biologic medicines in psoriasis has prompted the development of comparable treatments for other chronic inflammatory illnesses, such as atopic dermatitis, hidradenitis suppurativa, alopecia areata, lupus erythematosus, vitiligo, and pyoderma gangrenosum, among others. Among these, progress in atopic dermatitis has been particularly noteworthy. The pathophysiology of atopic dermatitis, a disorder whose name literally means “out-of-place inflammation”, has previously been poorly understood. The identification of the pivotal significance of the Th2 signalling axis has had a dramatic impact on medication development. Targeting cytokines such as IL-4, IL-13, and IL-31, as well as their downstream signalling through the JAK-STAT pathway, has resulted in long-term symptom improvement.[44] Patients have reported considerable improvements in pruritus, sleep quality, and psychological well-being, ushering in a new era in the treatment of this complex condition. However, it needs to be examined if these therapies will provide equivalent long-term systemic advantages to biologics in psoriasis.

In dermatology, quantum medicine has created new opportunities by studying how photons interact with biological systems. Recent studies have demonstrated how the skin reacts to non-ultraviolet light, including visible spectrum and near-infrared wavelengths. Opsins, or visible light photoreceptors, are present in the skin and the retina and hypothalamus, where they regulate metabolism, thermogenesis, and circadian rhythms.[51] It has been demonstrated that red and near-infrared wavelengths, which are prevalent in the environment since plant chlorophyll can only absorb a small amount of them, may thoroughly penetrate the skin. These wavelengths support tissue healing and improve mitochondrial activity, which lays the groundwork for photobiomodulation as a therapeutic strategy. This has created innovative treatment options for treating inflammatory skin disorders.

In summary, the treatment landscape for chronic dermatoses significantly evolutionized within the past two decades, with biologics and JAK inhibitors providing new hope for patients who previously had limited options of therapy. Future dermatological therapy is expected to become more customized as we continue to understand the molecular underpinnings of these complicated conditions, potentially improving patient outcomes and quality of life for patients all over the world.

CONCLUSION

In frames of the aim of the article, in the process of outlining the integrative landscape of paradigms, visions, and approaches within the field of diagnosis and treatment of chronic dermatoses, we found that lacking of curative therapies for chronic inflammatory skin diseases still continues to be one of dermatology’s most urgent problems. The worldwide prevalence of skin malignancies and chronic skin inflammatory diseases is still rising despite major treatment improvements, which indicates the urgent need for more research. While the exact origins of this paradox are yet unknown, environmental and lifestyle variables such the widespread use of processed foods, imbalanced diets, restricted access to natural sunshine, and other negative effects of contemporary lifestyle are believed to be the drivers. Future research must focus on addressing these underlying causes, which frequently intersect with those of other chronic illnesses. Examining the same processes that underlie skin conditions and systemic inflammation may result in preventative measures that improve general health and have advantages that go well beyond dermatology.

Analysis of literature sources and vectors of current practices and research shows that new treatment approaches, meantime, offer encouraging opportunities for the research of dermatitis and psoriasis. Biologic product research and development is still ongoing, and new medications targeting various targets are being created using enhanced genetic engineering technology, which should enhance the therapeutic impact. Because of their facile mass manufacture and oral comfort, small-molecule targeted medicines are emerging as a research hotspot. In order to increase clinical availability, future research and development will concentrate on lowering medication prices and improving pharmacological mechanisms of action. A thorough investigation of the long-term survival rate and immune rejection of grafts in vivo is essential to the development of cell transplantation technology, which offers a novel concept for regenerative medicine. Enhancing the total therapeutic impact through a synergistic effect will become a key area of future study, as the combination therapy strategy incorporating a number of novel medicines is now showing promise. The development of customized medicine, which is anticipated to transform the conventional treatment landscape and enhance

patients' quality of life, is made possible by these investigations in addition to opening up new avenues for illness treatment.

Meanwhile, innovative devices, imaging technologies, and therapy modalities will become more accessible with the growth of technology. Artificial intelligence and machine learning tools expectedly will have a significant beneficial impact on dermatological practice in the future. New technology might improve clinical judgment, reduce intrusive procedures, and allow tracking the effectiveness of treatment. These developments might eventually be a standard component of imaging and diagnostic toolkit in dermatology.

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The authors declare that there are no conflicts of interest in this study.

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