Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Medical Sciences

Impact of Mental Health on Skin Disorders: Investigating the Bidirectional Relationship Between Stress and Conditions like Acne, Vitiligo, and Psoriasis

Shihan Khalaf Jafar Alja'afreh[1*]

[1]Primary Health Care Corporation (PHCC), Qatar

DOI: https://doi.org/10.36347/sjams.2024.v12i12.006 | **Received:** 27.10.2024 | **Accepted:** 02.12.2024 | **Published:** 05.12.2024

***Corresponding author:** Shihan Khalaf Jafar Alja'afreh
Primary Health Care Corporation (PHCC), Qatar

Abstract **Review Article**

There is a close connection between skin diseases and mental health. This connection has recently gained the attention of researchers. The main objective of this study is to review the updates of cited literature about the impacts of mental health on skin disorders. The research team used the most popular research engines including Science direct, Pub med, Google Scholar, and others to extract the appropriate materials to make this article. The results of cited literature emphasized the existence of bidirectional relationship between mental health and skin disorders. This means that either of them will impact the other. Stress is a common factor in both.

Keywords: Mental health, skin disorders, stress, acne, vitiligo, psoriasis.

Copyright © 2024 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION

The close connection between skin and mental health is only now starting to be thoroughly understood (LAZĂR *et al.*, 2023). For example, we now know that acne, psoriasis, vitiligo, and other dermatological conditions can be worsened by stress, in addition to numerous other factors, either psychological or psychiatric, factors which prolong the condition and lower the patient's quality of life (Lakum, 2024). This essay sets out to examine this anxiety-skin relationship; that is, examining how these skin conditions can initiate or maintain anxiety and depression, and how anxiety and depression can maintain or trigger dermatological troubles such as acne, alopecia areata, body-focused excoriation, neurodermatitis, onychophagia, psoriasis, urticaria, vitiligo, and more (Carniciu *et al.*, 2023). It is important to systematically investigate these relationships in order to accurately diagnose sufferers and offer the most adequate evidence-based treatments, which are still too often not administered (Salari *et al.*, 2024).

The focus is placed on acne, psoriasis, and vitiligo in order to provide detailed information sufficient to be reader-friendly and detailed in these conditions, but the bidirectional relationship between stress and skin disorders can be found in other skin conditions (Dalgard *et al.*, 2020). Several terms need to be operationally defined in this essay, due to the risk of not using them correctly (Cortés *et al.*, 2022). Mental health distress is often experienced in dermatology patients, with a study showing that negative life events, socioeconomic status, low self-esteem, and the presence and visibility of the skin disorder were associated with mood and anxiety disorders (Lada *et al.*, 2020). As many as 60-80% of dermatological patients, typically with pruritic or oncologic conditions, have psychiatric disorders and often experience anxiety or depression. Treating a psychiatric disorder can result in canceled doctor, dermatologist, and non-psychiatrist consultations (Schuster *et al.*, 2020). In a tertiary care setting, one study estimated costs such as medical costs, unemployment, and government costs of 21,000 euros per patient (Christensen and Jafferany, 2023).

1.1. Background and Rationale

Since ancient times, the relationship between mental health and dermatological disorders has been hinted at. Interdisciplinary studies have shown how the experience of living with a skin condition can negatively influence the mental well-being of sufferers, while psychological and emotional stressors have repercussions on various dermatoses (Fabrazzo *et al.*, 2021). Dermatological disorders caused or aggravated by psychological stressors have thus far tended to center on psychodermatological diseases, but rather less so on the impact of stress on common dermatological conditions (Mavrogiorgou *et al.*, 2020). As a result, research on

stress and skin health in different socioeconomic populations will offer new insights into developing personal, psychological, and dermatological treatments to enhance psychological and dermatological outcomes (Mavrogiorgou *et al.,* 2020). Despite the increasing research on the very close relationship between dermatology and psychology, studies from different levels on the repercussions of stress on common skin disorders are still rare (Kamal *et al.,* 2024). Stress has been recognized as a primary comorbid contributor to a number of dermatological disorders, and it is common for those with dermatological conditions to report psychological and psychiatric issues, including anxiety and depression (Konstantinou and Konstantinou, 2020). A number of qualitative studies have also consistently reported the negative psychosocial impact of having a skin condition (Matthews and Ali, 2022). In terms of medical treatment, many standard treatments in dermatology now have only the expectation of either fewer side effects as ambitious goals or promise hypotheses approximately how the positive mental effects of current treatment will encourage emotionally and psychologically enhanced responses to dermatological treatment (Marek-Jozefowicz *et al.,* 2022). While the emergence of combined research in dermatology and psychology advances the chance of unveiling potential direct and indirect mechanisms linking stress to skin diseases and vice versa, the development of collaborative research is on the horizon (Toussi *et al.,* 2021). Further tools to improve clinical management include psychodermatology, incorporating a holistic approach that stresses both psychological and dermatological specialized recognition and management of abnormal conditions, and cultural competency training for healthcare professionals, which has been warranted in the investigation (Jafferany *et al.,* 2020; Cortés *et al.,* 2022).

2. Understanding Skin Disorders

Skin disorders are highly common conditions that can include infections, growths, and reactive or autoimmune disorders like acne, eczema, psoriasis, urticaria, and vitiligo. Acne, for example, affects over 600 million people, mainly older teens and adults (Hammill, 2024). Other lifetime conditions include psoriasis, which affects around 125 million people, and vitiligo, which affects approximately 2% of the world population (Burch and Prok, 2020). They can result in varying irritation such as itch or pain in addition to notably visible skin manifestations, and the emotional suffering or discomfort arising from which remains underappreciated across a range of cultural backgrounds (Bhate, 2024). Additionally, such disorders have now been linked with severe physical health concerns, further necessitating expertise to produce the most comprehensive understanding and treatments (Cruz *et al.,* 2023).

Probable causes of skin disorders include genetic, environmental, and lifestyle factors, including smoking, obesity, and alcohol intake. Such lifestyle factors also hold for mental disorders, and several studies have evaluated smoking as it pertains to psoriasis during adolescence (Zhang *et al.,* 2023). Distress or stress can also act as triggers and precipitants or as maintaining factors (Zhang *et al.,* 2023). Notably, when considering acne as an adolescent skin disorder, research has revealed that stress can instigate or exacerbate acne symptoms via possible mediation by neuroendocrine signals (Pondeljak and Lugović-Mihić, 2020). High stress is a common factor reported by acne volunteers, and a range of skin conditions, such as alopecia areata, as well as vitiligo, likely relapse due to high stress, among other mental features (Skobowiat *et al.,* 2022). Such an intertwining of skin and mind elaborates the need to understand skin disorders more comprehensively (Saric-Bosanac *et al.,* 2020). Indeed, long-term difficult-to-treat skin disorders can impact mental well-being and may have ramifications for lifetime well-being (Chen *et al.,* 2022). Interventions oriented towards those that treat both the dermatological and psychosocial manifestations of a disorder are based on an understanding that dermatological and psychological complaints are bidirectionally entwined (Langan, 2024).

2.1. Common Skin Disorders

Acne vulgaris is a common disease of the pilosebaceous unit characterized by excessive retention of mature desquamated comedones, which are colonized by Propionibacterium acnes, and reduction of mature comedones to small, superficial scars (Carmina *et al.,* 2022). Acne is equally distributed between males and females, and it is more common in individuals with increased levels of androgens (Zhang *et al.,* 2022). Next to teenagers, pregnant females, at menarche, and in menopause are more prone to developing acne (Borzyszkowska *et al.,* 2022). Acne presents with non-inflammatory lesions as well as inflammatory lesions (Borzyszkowska *et al.,* 2022). Acne lesions predominantly appear on the face, back, and chest (Borzyszkowska *et al.,* 2022). The disease primarily affects the individual's quality of life through physical, mental, and social impacts (Gayen *et al.,* 2021). Acne inversa is a chronic inflammatory skin disease characterized by abscesses, draining fistulas, and scars predominantly localized at intertriginous skin areas (Gayen *et al.,* 2021). The disease is far more severe when compared to acne vulgaris and occurs later in life, usually after puberty (Gayen *et al.,* 2021). Psychiatric comorbidities in acne inversa are generally present, and a long progression of the disease may have a great impact on mental health (Nasir *et al.,* 2023). Psoriasis is a chronic inflammatory skin disorder that is more common in Western populations than in East Asians (Nasir *et al.,* 2023). Eczema/atopic dermatitis is a relapsing, chronic, pruritic skin disorder that currently affects up to 20% of children and 3% of adults globally (Szybiak *et al.,* 2023). Vitiligo is a disease characterized by complex interactions between the cells of the epidermis, specifically melanocytes around hair, and the

environmental elements (Nandy and Shrivastava, 2024). Vitiligo has a worldwide distribution, and it does not concentrate in a specific racial or ethnic group (Nandy and Shrivastava, 2024). In the population under 40 years old, events such as emotional or work-related stress may trigger or aggravate the disease in genetically predisposed individuals (Nandy and Shrivastava, 2024). Typically, patients experience anxiety, irritation, anger, and helplessness. In general, skin diseases cause stigmatization, social isolation, and sometimes self-destructive thoughts (Nandy and Shrivastava, 2024).

2.2. Causes and Triggers

Skin diseases have many causes, including psychological causes, and are difficult to classify as purely external or purely internal, as the relationships between causes and effects can be circular (Passeron *et al.,* 2021). The causes can be seen as a combination of biological, environmental, psychological, and psychiatric factors (Zhang *et al.,* 2023). Many people experience the onset or an exacerbation of symptoms in skin disorders following stress or trauma, often for the first time in their lives and frequently during developmental stages, such as puberty or adolescence (Parker *et al.,* 2022). The causes of skin disease are complex and varied, including genetic, environmental, psychological, and motivational factors that interact with each other and even with many products used to treat skin (Balieva *et al.,* 2022).

Alongside genetics, trigger factors in the environment can set off a chain of physiological reactions in the body that lead to skin disorders (Zhang *et al.,* 2023). These can be divided into biologically based trigger factors and environmental factors such as climate, lifestyle, allergens, and a range of psychological and psychosocial factors (Mento *et al.,* 2020). Many people also describe how they have discovered that metals, certain foods, house dust mites, or other allergens appear to act as trigger factors in their skin (Parker *et al.,* 2022). There is significant evidence that the psychological stress associated with examinations can lead to known pre-existing skin disorders becoming much worse (Clarke *et al.,* 2022). Mental health can also be affected by having a physical skin disorder. There are many descriptions of external causes that make skin disease worse (Mangini *et al.,* 2022).

3. Mental Health and Stress

Mental health is a state of emotional, psychological, and social well-being (Søvold *et al.,* 2021). It is crucial to our overall well-being (Søvold *et al.,* 2021). When any component of mental health is impaired, it can lead to psychological conditions or psychiatric disorders (Fusar-Poli *et al.,* 2020). The impact might be mild, such as mood swings, or might be debilitating, such as depression, impulsive disorders, or compulsive disorders, impacting our daily lives (Godinić and Obrenovic, 2020).

One of the psychological conditions that contribute to an increase in such stress is known as frustration (LAZÃR *et al.,* 2023). Problems such as getting late for an interview, traffic, bad grades, or even defeat while playing can trigger stress (Zhang *et al.,* 2023). If exposure to such incidents continues to trigger stress, one can experience frustration (Kelly *et al.,* 2021). As stress levels begin to rise, prolonged anxiety can manifest as irritation or even depression-related diseases (Cortés *et al.,* 2022). But this process may also occur the other way around (Cortés *et al.,* 2022). A lot of research has been done in the past to show how negative emotions affect physical health (Mento *et al.,* 2020). Many skin disorders have been shown to appear faster, get worse, and may rapidly reappear (Balieva *et al.,* 2022). Stress can make conditions like acne, vitiligo, psoriasis, rosacea, atopic dermatitis, alopecia, urticaria, or hives either the precipitating cause or the root cause (Passeron *et al.,* 2020).

All these conditions are connected through common pathways or various physiologies that are responsive to prolonged stress or mental diseases (Kelly *et al.,* 2021). Cognitive symptoms that are seen as a result of a prolonged stress period are caused by decreased production of three major hormones, affecting the production of one another (Mento *et al.,* 2020). Interestingly, these pathways also result in sexual dysfunction, as fertility in both men and women is considered more of an indicative sign of physical health than any other system (Zhang *et al.,* 2023). Hormonal differences result in various other hormonal feedback that affects the body's inflammatory response (Balieva *et al.,* 2022). Social dysfunction results when the body throws whatever inflammatory response decides sexual dysfunction, causing the signs to no longer be seen theoretically on any of it (Pondeljak and Lugović-Mihić, 2020). Consequently, being stressed or mentally ill worsens both the signs and symptoms of skin disease further, crippling faith and hope, resulting in an even slower cure rate (Passeron *et al.,* 2021). A condition and the emotional stress due to marks and activities have to be addressed as a whole, and so they have to be treated (Farage, 2022; Papa *et al.,* 2023).

3.1. Definition and Concepts

It is important to establish a clear definition of the terms 'mental health' and 'stress', as both have a direct influence on the emergence and evolution of skin disorders (Cortés *et al.,* 2022). The use of terms like 'anxiety' and 'depression' may confuse the association between dermatosis and mental health (Marek-Jozefowicz *et al.,* 2022). Although these are the most well-known psychiatric morbidities, other diagnoses also occur. Thus, depression and/or anxiety are referred to below (Gieler *et al.,* 2020). Conversely, the term 'psychosocial', which is often used to indicate physical health conditions, means having one's life influenced by biological and psychological aspects, by social and

cultural roles, and by social and material conditions of life (Pondeljak and Lugović-Mihić, 2020).

Stress is a psychological and physiological response of the body when facing unexpected or disturbing situations (Wang *et al.,* 2023). It allows the body to oxidize, which is essential for survival (Wang *et al.,* 2023). Stress is not an emotional disorder but can, if prolonged, trigger symptoms of anxiety and depression (Liu *et al.,* 2023). An external demand or stressor involves aspects focused on everyday events, e.g., work, bills, and children. Interpersonal relationships such as dealing with coworkers and other people, inequalities and power relations, and not living up to expected norms and behaviors are also stressors (Mo *et al.,* 2024). The stressor can be external, but we have the ability to modulate and initiate stress through cognitive resources and resilience (Hedemann *et al.,* 2022). Researchers have also shown that the relationship between mental health and psoriasis is bidirectional (Hedemann *et al.,* 2022). Some studies suggest that psoriasis severity can influence psychological well-being in other conditions such as work, leisure, and social relationships (Freuer *et al.,* 2022). Other research supported a path analysis in their own study, which explained the bidirectional association between psoriasis and depression (Min *et al.,* 2020). According to the hypothesis, previous depression predicted new cases of psoriasis, controlled for stress. Although this limitation is common, it did show the importance of using bidirectional approaches (Li *et al.,* 2022).

3.2. Biological Mechanisms

The bidirectional relationship between skin conditions and mental health is heavily driven by biological changes taking place in stressful situations that affect skin status (Fabrazzo *et al.,* 2021). Typical acute pathway changes include changes in peripheral and central areas of the organism (Carniciu *et al.,* 2023). Stress is a perceived phenomenon activating many biological systems (Zhang *et al.,* 2023). Typical modulators of the stress response that have an impact on skin status are various hormones, the most important being cortisol, which induces anti-inflammatory activity that is part of the anti-stress machinery (Bottaccioli *et al.,* 2022). However, there are other major pathways, such as sympathetic, which considerably affect skin status through the skin's immune system— increasing inflammation and barrier function—weakening when the organism is undergoing stress (Jackson *et al.,* 2021). As a result of the potential threat to the organism, it diminishes energetically expensive processes and hormones (Yang *et al.,* 2024).

In summary, the stress processes make the situation worse with regard to most skin disorders as they create an inflammatory environment in the body and skin, as well as reducing the capacity for healing and repair (Passeron *et al.,* 2020). The immunological milieu of the skin will program the NEM axis through the brain and depress any natural immunity, thus causing further inflammation that can perpetuate the skin disease (Pondeljak and Lugović-Mihić, 2020). As conditions that affect the CNS can cause skin changes, it is also true that skin disease severity may be predicted by personality type in conditions that have a CNS connection, particularly in multiple sclerosis, the immunological background of which is driven by stress and the pituitary gland (Chen *et al.,* 2021). Taken together, this all suggests that a person's mental or psychological well-being and the skin's natural barrier function are interdependent; thus, conditions are often best treated using a two-pronged approach, addressing the condition's homeostasis from both sides, incorporating both psychological therapies, drugs, and adrenaline inhibitors (Papaccio *et al.,* 2022).

4. The Bidirectional Relationship

Contrary to the study, the straightforward correlation in this direction is also suggested by findings from the association of acne and psoriasis in a very large patient population (Passeron *et al.,* 2020). Medical literature is also replete with instances of patients' stress being imputed as a major factor in the triggering and exacerbation of multiple types of skin conditions. Associations are found to be equally bidirectional (Pondeljak and Lugović-Mihić, 2020). Psoriasis, vitiligo, and alopecia areata may extend beyond localized visual and instrumental proof of their presence and severity to negative mental consequences for people's mental health (Golpanian *et al.,* 2020). The reflections of stress on people's mental health might, in turn, drive skin condition exacerbation (Konstantinou and Konstantinou, 2020).

The psychological and emotional impact on patients facing cutaneous conditions is important to underline in this respect. Many patients with visible flaws such as acne, psoriasis, and hair loss often suffer from expectations that influence the patient-physician relationship and medical treatment (Sterkens *et al.,* 2021). Self-esteem can be exaggerated by the patient-perceived influence of acne and psoriasis. Such disorders can also interfere with work, loving connections, and quality of life, leading to withdrawal from the social network, depression, body dysmorphophobia, and more anxiety (Punton *et al.,* 2022). It has been suggested by the bidirectional hypothesis that there are different problems for immigration in nations such as the UK and America (Nguyen *et al.,* 2020). The presence of psychological involvement, such as body image and anxiety, does not only influence the patient-physician relationship, but the patient may also contribute to an increase in the flare-up of their skin disease by causing more depression (Firth-Cozens, 2023).

4.1. Stress as a Trigger

This subsection highlights that stress can be a trigger for psoriasis, acne, and vitiligo. Acute or chronic stress can cause or exacerbate diseases (Goyal and

Prabhu, 2023). The designations in the flowchart include examples that show how stress can have effects on the skin and how dermatological patients can be severely affected in their daily lives (LAZĂR *et al.,* 2023). Furthermore, it is explained which physiological processes are activated by stress in the body and how psychological processes influence them (Zhang *et al.,* 2023). Situational and psychosomatic aspects are used to substantiate the pathogenetic connection (Lakum, 2024). Resilience and lifestyle have a significant influence on the mental and skin health of those affected by skin diseases (Passeron *et al.*, 2020). Therefore, resilience and lifestyle must be researched in this way in order to develop effective recommendations for prevention and therapy to reduce stress and thus skin diseases (Carniciu *et al.*, 2023).

Examples of how stress is a trigger for psoriasis, acne, and vitiligo are set forth below. Psoriasis plaques show higher expression of a proinflammatory cytokine in comparison to non-lesional skin, and apoptosis of keratocytes and the infiltration of lymphocytes is higher in psoriasis (Sukhareva, 2021). Stress leads to elevated corticotropin-releasing hormone in the plasma, rather than simply to the glucocorticoid (Chaves *et al.,* 2021). Further, injection of this hormone into autologous lesional skin has an eruptive effect (Filaretova *et al.,* 2021). Changes in the human hair follicle are associated with the expression of stress hormones (Eick *et al.,* 2022). Experiments clarify brain-skin and neuro-immuno-cutaneous interaction in depth for readers and awards for this research (Eghtesad *et al.,* 2022). Stress can also give rise to recurrences of other skin diseases; for instance, psoriasis, seborrheic eczema, basal-cell carcinoma, prurigo, recurrent ulcer, etc., and a sudden worsening of acute generalized exanthematous pustulosis, which resulted in hospitalization, is presumed to have been the result of well-defined physical stress in a case report (Kageyama *et al.,* 2021).

4.2. Impact of Skin Disorders on Mental Health

Acne, psoriasis, eczema, vitiligo, alopecia, and many systemic skin conditions are visible and are often stigmatized, exacerbating various aspects of quality of life, including emotional well-being, social functioning, self-image, subjective life satisfaction, and self-esteem (Hölsken *et al.,* 2021). Early seminal work in this area found that clinical depression is twice as frequent in patients with psoriasis as in the general population (Duvetorp *et al.,* 2021). Dermatological symptoms cause psychosocial distress such as social anxiety, depression, anger, embarrassment, frustration, self-critical feelings, feelings of being unattractive, reduced self-esteem, and poor body image, negative feelings toward their physicians, and prejudice at work and in relationships (Zusman *et al.,* 2020). In turn, these can precipitate loss of self-worth, feelings of isolation, and increased prevalence of suicidal ideation; these psychosocial consequences can interfere with treatment effectiveness and adherence (Hedemann *et al.,* 2022).

New research has since validated and extended these findings. In a study of 60 people with psoriasis, two-thirds reported feeling stigmatized. An investigation of in-depth personal accounts from people with severe psoriasis found that 55% of participants experienced prejudice (Sommer *et al.,* 2020). Two phenomenological analyses of the lived experiences of people with subcutaneous conditions found that a permeating sense of chronic unease and ideologies of 'protect and conceal' were central to the lived world of the participants (Wan *et al.,* 2020). Other research has underscored the importance of providing patient support: a study reported that patients were unable to carry on with their lives because of how they were emotionally affected (Kowalewska *et al.,* 2021). It was concluded that distressed patients are more frequently those who experience adverse reactions to the greatest visible disfigurement (Okuse *et al.,* 2024). As reported by mental health advocates, 'depression underlies these skin conditions; they mess with your self-esteem and it affects you a lot (Ibrahim *et al.,* 2024). For some who are more high functioning, they can function fairly well—once the condition starts affecting them so badly that the psychological harm builds up, then it's a vicious cycle: it just gets worse and worse because the more the newness of the condition falls into place, people become more and more secluded. In the end, everything intrudes on them (Wu *et al.,* 2024).

5. Clinical Implications and Interventions

The bidirectional relationship between psychological states and skin conditions highlights the importance of integrated approaches for treating skin and mind (Fabrazzo *et al.,* 2021). In this respect, this review suggests the importance of training healthcare professionals in the field of psychodermatology, encouraging holistic perspectives and consideration of cutaneous, immunological, and psychological aspects of skin diseases (Balieva *et al.,* 2022). In particular, the training of dermatology practitioners is crucial to grasp the psychological implications of skin disorders and the interactions between skin tissue and psychological states (Nowowiejska *et al.,* 2021). Furthermore, psychologists and psychiatrists should be knowledgeable about skin conditions to identify, treat, and manage patients with skin diseases and comorbid mental health disorders (Borrego-Ruiz and Borrego, 2024). Healthcare professionals may provide evidence-based therapeutic strategies proven to improve both skin conditions and psychological disorders, such as cognitive-behavioral therapy and mindfulness, and refer patients with skin conditions and poor mental states to support groups, community resources, and healthcare professionals able to provide psychological and psychiatric management or psychotherapy for their mental well-being (Birdi *et al.,* 2022). These strategies have been proven to be effective in promoting mental and skin health and thus may be used to prevent skin symptoms due to psychological distress or control skin conditions due to psychiatric disorders (Yang *et al.,* 2022).

Unfortunately, many patients face challenges in accessing healthcare and often begin their treatment journey with their dermatologists (Fabrazzo *et al.,* 2021). In these cases, the construction of multidisciplinary psychocardiological teams and communication and information sharing between dermatology and mental healthcare providers play an important role (Fabrazzo *et al.,* 2021). Indeed, ongoing dialogue and collaboration between mental healthcare providers and dermatology staff can empower and increase the mental well-being and, consequently, the treatment response of individuals suffering from skin conditions (da *et al.,* 2022). The bidirectional interactions between psychological traits and skin disorders, including acne, vitiligo, psoriasis, and other diseases, have been demonstrated, and several instruments for investigating the psychological state in individuals with skin disorders have been validated and can be used by dermatology practitioners (Borrego-Ruiz and Borrego, 2024).

5.1. Psychodermatology Approaches

From the above overview, it is clear that science is only scratching the surface of understanding these mental health and skin disorders (Lakum, 2024). Now, the bidirectional relationships of stress to skin conditions like acne, psoriasis, and vitiligo will be examined from psychodermatology approaches (Lakum, 2024). Psychodermatology is a subspecialty that deals with the psychological aspects of dermatology, which is the study of the skin. In medicine, psychology, dermatology, and surgery, this union of disciplines can provide the greatest reward to the patient (Carniciu and Jafferany, 2023)). Psychodermatology is moving from a descriptive field to a more clinical science of psychodermatology: integrating medicine, surgery, dermatology, and psychology to improve patient care (Fabrazzo *et al.,* 2021). This stands educationally as well as for influencing research forged by positions at the intersection of dermatology and psychology (Carniciu *et al.,* 2023). Discrete psychological care within the dermatological sphere is provided to patients with skin problems and mental health needs (Latheef and Hafi, 2023). Therapies have proliferated alongside treatments for intractable skin complaints, particularly chronic skin disease (Jafferany *et al.,* 2020).

One's approach to the relationship between psychology and dermatology may depend on one's discipline (Layton *et al.,* 2021). From the dermatologic perspective, mental health should be treated to improve cutaneous outcomes (Layton *et al.,* 2021). With the development of topical therapies, many have pushed for the breakdown of the "mind-oriented" or topical-based or "blended" way of thinking and are rejected (Himmerich *et al.,* 2021). Cognitive-behavioral techniques are similar to skincare that purportedly reduces skin inflammation for the topical approach (Zhao *et al.,* 2022). Patient outcomes could also improve with a better doctor-patient relationship, and focused patient care could empower patients to assist in managing their skin problems (Das *et al.,* 2021). Using a dialectical perspective, treatment methods tend to unite skin and mental health since many psychiatric and dermatological patients have both symptoms; however, this can deny the uniqueness and autonomy of both the psyche and the skin (Simons *et al.,* 2020). Practical examples underscore this approach with case-based, practical results (Louie, 2020). The difficulty with psychodermatology is that it is relatively new and that there is limited pooled referring or best evidence (Seirafianpour *et al.,* 2020). Practical, in-depth research is required. The ultimate goal is complete mental and physical healing for the practitioner and the patient (Passeron *et al.,* 2020).

5.2. Therapeutic Strategies

Besides addressing the play on complex exchanges underlying the relationship between anxiety and dermatological affections because of both processes involved (in the genesis and maintenance of mental health and skin disorders), the overall aim of this article is to provide the current best evidence between the two disciplines: dermatology and psychology (Marek-Jozefowicz *et al.,* 2022). Given the complexity of this topic, this article provides a first step in shedding light on effective interactions in the maintenance of both mental and skin health (either as a cause or as an effect), and in guiding the clinician in the construction of treatment pathways which include an accurate assessment of the mental state for both clinical disorders—mood and anxiety related behaviors—and the evaluation of basic psychological aspects of mental and dermatological health (Cao *et al.,* 2024). Now we approach the therapeutic strategies and treatment in the management of mental attitude, summarized in the frame which has been tailored according to our previous work and best evidence so far (Biazus *et al.,* 2024). Given the not negligible impact of the "brain-skin" axis, it is plausible that indeed a combination of the treatments previously described, in a multidisciplinary approach including psychotherapy focused on the reduction and acceptance of stress, with a promotion of self-acceptance and self-esteem, in parallel to medical treatment focused mainly on reducing potential targets of inflammation, could surely improve the skin conditions and consequently the overall quality of life of the patient (Wang *et al.,* 2021). In supporting the mindfulness plus dermatological care primary endpoints, several effects beyond the trend toward improvement or remission were observed for those treatments as well with various mind-body ecograms in reducing stress and skin irritation (Jameson *et al.,* 2023). Given this general background, the potential mechanisms of stress reduction upon skin are also briefly described (Weiglein *et al.,* 2022).

REFERENCES

- Balieva, F., Schut, C., Kupfer, J., Lien, L., Misery, L., Sampogna, F., ... & Dalgard, F. J. (2022). Perceived stress in patients with inflammatory and non-inflammatory skin conditions. An observational

controlled study among 255 Norwegian dermatological outpatients. *Skin Health and Disease*, *2*(4), e162. wiley.com

- Bhate, K. (2024). Long-term antibiotics for acne and antimicrobial resistance. lshtm.ac.uk
- Biazus Soares, G., Mahmoud, O., Yosipovitch, G., & Mochizuki, H. (2024). The mind–skin connection: A narrative review exploring the link between inflammatory skin diseases and psychological stress. *Journal of the European Academy of Dermatology and Venereology*, *38*(5), 821-834. [HTML]
- Birdi, G., Larkin, M., & Knibb, R. C. (2022). Prospective analysis of the temporal relationship between psychological distress and atopic dermatitis in female adults: a preliminary study. *Healthcare*. mdpi.com/
- Borrego-Ruiz, A. & Borrego, J. J. (2024). Microbial dysbiosis in the skin microbiome and its psychological consequences. *Microorganisms*. mdpi.com
- Borzyszkowska, D., Niedzielska, M., Kozłowski, M., Brodowska, A., Przepiera, A., Malczyk-Matysiak, K., ... & Sowińska-Przepiera, E. (2022). Evaluation of hormonal factors in acne vulgaris and the course of acne vulgaris treatment with contraceptive-based therapies in young adult women. *Cells*, *11*(24), 4078. mdpi.com
- Bottaccioli, A. G., Bologna, M., & Bottaccioli, F. (2022). Psychic life-biological molecule bidirectional relationship: pathways, mechanisms, and consequences for medical and psychological sciences—a narrative review. *International journal of molecular sciences*, *23*(7), 3932. mdpi.com
- Brown, C. (). A systematic review into the psychosocial effects of acne vulgaris on female adolescents. sites.edgehill.ac.uk. edgehill.ac.uk
- Burch, J. M., & Prok, L. D. (2020). Acne and Acneiform Eruptions. Dermatology Secrets: Dermatology Secrets E-Book. [HTML]
- Cao, C., Lei, J., Zheng, Y., Xu, A. E., & Zhou, M. (2024). The brain-skin axis in vitiligo. *Archives of Dermatological Research*, *316*(8), 607. [HTML]
- Carmina, E., Dreno, B., Lucky, W. A., Agak, W. G., Dokras, A., Kim, J. J., ... & Dumesic, D. (2022). Female adult acne and androgen excess: a report from the multidisciplinary androgen excess and PCOS committee. *Journal of the Endocrine Society*, *6*(3), bvac003. oup.com
- Carniciu, S. & Jafferany, M. (2023). Psychophysiological disorders and the skin. *Dermatological Reviews*. [HTML]
- Carniciu, S., Hafi, B., Gkini, M. A., Tzellos, T., Jafferany, M., & Stamu-O'Brien, C. (2023). Secondary psychiatric disorders and the skin. *Dermatological Reviews*, *4*(4), 162-171. researchgate.net
- Chaves, T., Fazekas, C. L., Horváth, K., Correia, P., Szabó, A., Török, B., ... & Zelena, D. (2021). Stress adaptation and the brainstem with focus on corticotropin-releasing hormone. *International journal of molecular sciences*, *22*(16), 9090. mdpi.com
- Chen, H., Zhang, T., Xu, X., Wan, S., & Wang, Y. (2022). Review of Skin Problems Caused by Stress. *J. Clin. Med. Res*. front-sci.com
- Chen, J., Liu, Y., Zhao, Z., & Qiu, J. (2021). Oxidative stress in the skin: Impact and related protection. *International Journal of Cosmetic Science*, *43*(5), 495-509. wiley.com
- Christensen, R. E. & Jafferany, M. (2023). Psychiatric and psychologic aspects of chronic skin diseases. *Clinics in Dermatology*. [HTML]
- Clarke, E. N., Norman, P., & Thompson, A. R. (2022). How does self-compassion help people adjust to chronic skin conditions? A template analysis study. *Frontiers in Medicine*. frontiersin.org
- Cortés, H., Rojas-Márquez, M., Del Prado-Audelo, M. L., Reyes-Hernández, O. D., González-Del Carmen, M., & Leyva-Gómez, G. (2022). Alterations in mental health and quality of life in patients with skin disorders: a narrative review. *International journal of dermatology*, *61*(7), 783-791. [HTML]
- Cruz, S., Vecerek, N., & Elbuluk, N. (2023). Targeting inflammation in acne: current treatments and future prospects. *American journal of clinical dermatology*. springer.com
- da Silva, N., Augustin, M., Hilbring, C., Braren-von Stülpnagel, C. C., & Sommer, R. (2022). Psychological (co) morbidity in patients with psoriasis: the impact of pruritus and anogenital involvement on symptoms of depression and anxiety and on body dysmorphic concerns–a cross-sectional study. *BMJ open*, *12*(9), e055477. bmj.com
- Dalgard, F. J., Svensson, Å., Halvorsen, J. A., Gieler, U., Schut, C., Tomas-Aragones, L., ... & Kupfer, J. (2020). Itch and mental health in dermatological patients across Europe: a cross-sectional study in 13 countries. *Journal of Investigative Dermatology*, *140*(3), 568-573. sciencedirect.com
- Das, K., Cockerell, C. J., Patil, A., Pietkiewicz, P., Giulini, M., Grabbe, S., & Goldust, M. (2021). Machine learning and its application in skin cancer. *International Journal of Environmental Research and Public Health*, *18*(24), 13409. mdpi.com
- Duvetorp, A., Mrowietz, U., Nilsson, M., & Seifert, O. (2021). Sex and age influence the associated risk of depression in patients with psoriasis: a retrospective population study based on diagnosis and drug-use. *Dermatology*. karger.com
- Eghtesad, M., Salmani, M. E., Lashkarbolouki, T., & Goudarzi, I. (2022). Lateral hypothalamus corticotropin-releasing hormone receptor-1 inhibition and modulating stress-induced anxiety

behavior. *Basic and Clinical Neuroscience*, *13*(3), 373. nih.gov.

- Eick, S. M., Goin, D. E., Cushing, L., DeMicco, E., Smith, S., Park, J. S., ... & Morello-Frosch, R. (2022). Joint effects of prenatal exposure to per-and poly-fluoroalkyl substances and psychosocial stressors on corticotropin-releasing hormone during pregnancy. *Journal of exposure science & environmental epidemiology*, *32*(1), 27-36. nature.com
- Fabrazzo, M., Cipolla, S., Signoriello, S., Camerlengo, A., Calabrese, G., Giordano, G. M., ... & Galderisi, S. (2021). A systematic review on shared biological mechanisms of depression and anxiety in comorbidity with psoriasis, atopic dermatitis, and hidradenitis suppurativa. *European Psychiatry*, *64*(1), e71. cambridge.org
- Farage, M. A. (2022). Psychological aspects of sensitive skin: A vicious cycle. Cosmetics. mdpi.com
- Filaretova, L. P., Morozova, O. Y., & Yarushkina, N. I. (2021). Peripheral corticotropin-releasing hormone may protect the gastric mucosa against indomethacin-induced injury through involvement of glucocorticoids. *Journal of Physiology & Pharmacology*, *72*(5). jpp.krakow.pl
- Firth-Cozens, J. (2023). A perspective on stress and depression. Understanding doctors' performance. [HTML]
- Freuer, D., Linseisen, J., & Meisinger, C. (2022). Association between inflammatory bowel disease and both psoriasis and psoriatic arthritis: a bidirectional 2-sample mendelian randomization study. *JAMA dermatology*. jamanetwork.com
- Fusar-Poli, P., de Pablo, G. S., De Micheli, A., Nieman, D. H., Correll, C. U., Kessing, L. V., ... & van Amelsvoort, T. (2020). What is good mental health? A scoping review. *European neuropsychopharmacology*, *31*, 33-46. sciencedirect.com
- Gayen, R., Podder, I., Chakraborty, I., & Chowdhury, S. N. (2021). Sex hormones, metabolic status, and obesity in female patients with acne vulgaris along with clinical correlation: an observational cross-sectional study. *Indian Journal of Dermatology*, *66*(1), 60-66. lww.com
- Gieler, U., Gieler, T., Peters, E. M. J., & Linder, D. (2020). Skin and psychosomatics–psychodermatology today. *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*, *18*(11), 1280-1298. wiley.com
- Godinić, D. & Obrenovic, B. (2020). Effects of economic uncertainty on mental health in the COVID-19 pandemic context: social identity disturbance, job uncertainty and psychological well-being model. philpapers.org
- Golpanian, R. S., Kim, H. S., & Yosipovitch, G. (2020). Effects of stress on itch. *Clinical therapeutics*. clinicaltherapeutics.com
- Goyal, N. & Prabhu, S. S. (2023). Stress and Common Dermatological Disorders: The Psychophysiological Dermatoses. *Clinical Dermatology Review*. lww.com
- Hammill, J. (2024). Acne, Depression, and Anxiety Symptoms in Young Adults. uottawa.ca
- Hedemann, T. L., Liu, X., Kang, C. N., & Husain, M. I. (2022). Associations between psoriasis and mental illness: an update for clinicians. *General Hospital Psychiatry*. [HTML]
- Himmerich, H., Kan, C., Au, K., & Treasure, J. (2021). Pharmacological treatment of eating disorders, comorbid mental health problems, malnutrition and physical health consequences. *Pharmacology & therapeutics*. bronsonhealth.com
- Hölsken, S., Krefting, F., Schedlowski, M., & Sondermann, W. (2021). Common fundamentals of psoriasis and depression. *Acta Dermato-Venereologica*, *101*(11). nih.gov
- Ibrahim, S. M. E., Elhgry, G., & Saad, M. T. (2024). Effect of Supportive Nursing Intervention on Feeling of Stigmatization and Quality of Life among Older Adults with Psoriasis. *NILES journal for Geriatric and Gerontology*, *7*(1), 202-225. ekb.eg
- Jackson, C. L., Dagher, R. K., Byun, J. S., Farhat, T., & Gardner, K. L. (2021). Getting under the skin: Pathways and processes that link social and biological determinants of disease. *The science of health disparities research*, 13-38. [HTML]
- Jafferany, M., Ferreira, B. R., & Patel, A. (2020). The essentials of psychodermatology. [HTML]
- Jameson, C., Boulton, K. A., Silove, N., Nanan, R., & Guastella, A. J. (2023). Ectodermal origins of the skin-brain axis: a novel model for the developing brain, inflammation, and neurodevelopmental conditions. *Molecular psychiatry*, *28*(1), 108-117. nature.com
- Kageyama, K., Iwasaki, Y., & Daimon, M. (2021). Hypothalamic regulation of corticotropin-releasing factor under stress and stress resilience. *International journal of molecular sciences*, *22*(22), 12242. mdpi.com.
- Kamal, K., Xiang, D. H., Young, K., Mostaghimi, A., Barbieri, J. S., Cohen, J. M., & Theodosakis, N. (2024). Comorbid psychiatric disease significantly mediates increased rates of alcohol use disorder among patients with inflammatory and pigmentary skin disorders: a case–control study in the All of Us Research Program. *Archives of Dermatological Research*, *316*(2), 79. [HTML]
- Kelly, K. A., Balogh, E. A., Kaplan, S. G., & Feldman, S. R. (2021). Skin disease in children: effects on quality of life, stigmatization, bullying, and suicide risk in pediatric acne, atopic dermatitis, and psoriasis patients. *Children*. mdpi.com
- Konstantinou, G. N. & Konstantinou, G. N. (2020). Psychological stress and chronic urticaria: a neuro-immuno-cutaneous crosstalk. A systematic review

of the existing evidence. *Clinical Therapeutics*. clinicaltherapeutics.com

- Kowalewska, B., Jankowiak, B., Cybulski, M., Krajewska-Kułak, E., & Khvorik, D. F. (2021). Effect of disease severity on the quality of life and sense of stigmatization in psoriatics. *Clinical, Cosmetic and Investigational Dermatology*, 107-121. tandfonline.com
- Lada, G., Talbot, P. S., Bewley, A., & Kleyn, C. E. (2020). Mental health and dermatology practice in the COVID-19 pandemic. *Clinical and experimental dermatology*, *45*(7), 816-817. nih.gov
- Lakum, M. (2024). The Hidden Struggle: Understanding the Psychosocial Impact of Dermatological Diseases. *Indian Journal of Postgraduate Dermatology*. ijpgderma.org
- Langan, E. A. (2024). Prolactin: A Mammalian Stress Hormone and Its Role in Cutaneous Pathophysiology. *International Journal of Molecular Sciences*. mdpi.com.
- Latheef, E. N. A. & Hafi, B. N. A. (2023). Introduction to Psychodermatology. *Clinical Dermatology Review*. lww.com
- Layton, A. M., Thiboutot, D., & Tan, J. (2021). Reviewing the global burden of acne: how could we improve care to reduce the burden?. *British Journal of Dermatology*. psu.edu
- LAZĂR, L. G., IOTU, A. D., NICOLAU, I., TUDOR, E. A., & RAD, F. (2023). PSYCHOLOGICAL STRESS AND DERMATOLOGICAL DISORDERS. *Romanian Journal of Child & Adolescent Psychiatry*, *11*. [HTML]
- Li, Y., Guo, J., Cao, Z., & Wu, J. (2022). Causal association between inflammatory bowel disease and psoriasis: A two-sample bidirectional mendelian randomization study. *Frontiers in immunology*. frontiersin.org
- Liu, S., Yang, K., Zhang, H., Yang, Q., & Bai, Y. (2023). The bidirectional causal association between psoriasis and psychological illnesses: a 2-sample Mendelian randomization study. *Archives of Dermatological Research*, *316*(1), 40. [HTML]
- Louie, P. (2020). Revisiting the cost of skin color: Discrimination, mastery, and mental health among Black adolescents. Society and Mental Health. sagepub.com
- Mangini, C. S. M., Vasconcelos, R. C. F. D., Rodriguez, E. V. R., & Oliveira, I. R. L. D. (2022). Social isolation: main dermatosis and the impact of stress during the COVID-19 pandemic. *Einstein (Sao Paulo)*, *20*, eAO6320. scielo.br
- Marek-Jozefowicz, L., Czajkowski, R., Borkowska, A., Nedoszytko, B., Żmijewski, M. A., Cubała, W. J., & Slominski, A. T. (2022). The brain–skin axis in psoriasis—psychological, psychiatric, hormonal, and dermatological aspects. *International journal of molecular sciences*, *23*(2), 669. mdpi.com
- Mavrogiorgou, P., Mersmann, C., Gerlach, G., Herpertz, S., & Juckel, G. (2020). Skin diseases in patients with primary psychiatric disorders. *Psychiatry investigation*, *17*(2), 157. nih.gov
- Mento, C., Rizzo, A., Muscatello, M. R. A., Zoccali, R. A., & Bruno, A. (2020). Negative emotions in skin disorders: a systematic review. *International Journal of Psychological Research*, *13*(1), 71-86. scielo.org.co
- Min, C., Kim, M., Oh, D. J., & Choi, H. G. (2020). Bidirectional association between psoriasis and depression: Two longitudinal follow-up studies using a national sample cohort. *Journal of Affective Disorders*. e-tarjome.com
- Mo, N., Yang, Y., Wang, W., Zhou, P., Liu, F., Zhang, Y., ... & Lu, C. (2024). Causal associations between psoriasis, eczema, urticaria, and mental illness: A bidirectional Mendelian randomization study of the European population. *Medicine*, *103*(26), e38586. lww.com
- Nandy, P. & Shrivastava, T. (2024). Exploring the multifaceted impact of acne on quality of life and well-being. *Cureus*. nih.gov Passeron, T., Zouboulis, C. C., Tan, J., Andersen, M. L., Katta, R., Lyu, X., ... & Peters, E. M. J. (2021). Adult skin acute stress responses to short-term environmental and internal aggression from exposome factors. *Journal of the European Academy of Dermatology and Venereology*, *35*(10), 1963-1975. wiley.com
- Nasir, R. S., Qasim, Q. A., & Mohammad, H. A. (2023). The hormonal effect of Acne vulgaris. *Journal of Wildlife and Biodiversity*, *7*(Special Issue), 180-185. wildlife-biodiversity.com
- Nguyen, M., Waller, M., Pandya, A., & Portnoy, J. (2020). A review of patient and provider satisfaction with telemedicine. *Current allergy and asthma reports*, *20*, 1-7. springer.com
- Nowowiejska, J., Baran, A., & Flisiak, I. (2021). Mutual relationship between sleep disorders, quality of life and psychosocial aspects in patients with psoriasis. *Frontiers in Psychiatry*. frontiersin.org
- Okuse, M., Soekawa, M., Itakura, A., Kawamura, T., Mburu, S., Frade, S., & Okubo, Y. (2024). Perspectives of Japanese patients on psoriatic disease burden: Results from "Psoriasis and Beyond," the Global Psoriatic Disease Survey. *The Journal of Dermatology*. wiley.com
- Papa, V., Li Pomi, F., Borgia, F., Genovese, S., Pioggia, G., & Gangemi, S. (2023). "Mens Sana in Cute Sana"—a state of the art of mutual etiopathogenetic influence and relevant pathophysiological pathways between skin and mental disorders: an integrated approach to contemporary psychopathological scenarios. *Cells*, *12*(14), 1828. mdpi.com
- Papaccio, F., Caputo, S., & Bellei, B. (2022). Focus on the contribution of oxidative stress in skin aging. *Antioxidants*. mdpi.com.

- Parker, E. R., Mo, J., & Goodman, R. S. (2022). The dermatological manifestations of extreme weather events: a comprehensive review of skin disease and vulnerability. *The Journal of Climate Change and Health*, *8*, 100162. sciencedirect.com
- Passeron, T., Krutmann, J., Andersen, M. L., Katta, R., & Zouboulis, C. C. (2020). Clinical and biological impact of the exposome on the skin. *Journal of the European Academy of Dermatology and Venereology*, *34*, 4-25. nutricaoesteticabrasil.com.br
- Pondeljak, N. & Lugović-Mihić, L. (2020). Stress-induced interaction of skin immune cells, hormones, and neurotransmitters. *Clinical therapeutics*. clinicaltherapeutics.com
- Punton, G., Dodd, A. L., & McNeill, A. (2022). 'You're on the waiting list': An interpretive phenomenological analysis of young adults' experiences of waiting lists within mental health services in the UK. *Plos one*. plos.org
- Salari, N., Heidarian, P., Hosseinian-Far, A., Babajani, F., & Mohammadi, M. (2024). Global Prevalence of Anxiety, Depression, and Stress Among Patients with Skin Diseases: A Systematic Review and Meta-analysis. *Journal of Prevention*, 1-39. researchgate.net
- Saric-Bosanac, S., Clark, A. K., Sivamani, R. K., & Shi, V. Y. (2020). The role of hypothalamus-pituitary-adrenal (HPA)-like axis in inflammatory pilosebaceous disorders. *Dermatology online journal*, *26*(2). escholarship.org
- Schuster, B., Ziehfreund, S., Albrecht, H., Spinner, C. D., Biedermann, T., Peifer, C., & Zink, A. (2020). Happiness in dermatology: a holistic evaluation of the mental burden of skin diseases. *Journal of the European Academy of Dermatology and Venereology*, *34*(6), 1331-1339. wiley.com
- Seirafianpour, F., Sodagar, S., Pour Mohammad, A., Panahi, P., Mozafarpoor, S., Almasi, S., & Goodarzi, A. (2020). Cutaneous manifestations and considerations in COVID-19 pandemic: a systematic review. *Dermatologic therapy*, *33*(6), e13986. nih.gov
- Simons, R. E., Zevy, D. L., & Jafferany, M. (2020). Psychodermatology of vitiligo: Psychological impact and consequences. *Dermatologic Therapy*. [HTML]
- Sommer, R., Topp, J., Mrowietz, U., Zander, N., & Augustin, M. (2020). Perception and determinants of stigmatization of people with psoriasis in the German population. *Journal of the European Academy of Dermatology and Venereology*, *34*(12), 2846-2855. wiley.comز
- Søvold, L. E., Naslund, J. A., Kousoulis, A. A., Saxena, S., Qoronfleh, M. W., Grobler, C., & Münter, L. (2021). Prioritizing the mental health and well-being of healthcare workers: an urgent global public health priority. *Frontiers in public health*, *9*, 679397. frontiersin.org
- Sterkens, A., Lambert, J., & Bervoets, A. (2021). Alopecia areata: a review on diagnosis, immunological etiopathogenesis and treatment options. *Clinical and experimental medicine*. [HTML].
- Sukhareva, E. V. (2021). The role of the corticotropin-releasing hormone and its receptors in the regulation of stress response. *Vavilov Journal of Genetics and Breeding*. nih.gov.
- Szybiak, W., Jarzemska, M., Kowalczyk, M., Sadowska-Przytocka, A., Więckowska, B., Żaba, R., & Lacka, K. (2023). Selected hormone levels and lipid abnormalities in patients with acne vulgaris. *Advances in Dermatology and Allergology/Postępy Dermatologii i Alergologii*, *40*(1). termedia.pl
- Toussi, A., Barton, V. R., Le, S. T., Agbai, O. N., & Kiuru, M. (2021). Psychosocial and psychiatric comorbidities and health-related quality of life in alopecia areata: a systematic review. *Journal of the American Academy of Dermatology*, *85*(1), 162-175. nih.gov
- Wan, M. T., Pearl, R. L., Fuxench, Z. C. C., Takeshita, J., & Gelfand, J. M. (2020). Anticipated and perceived stigma among patients with psoriasis. *Journal of Psoriasis and Psoriatic Arthritis®*, *5*(3), 93-99. nih.gov.
- Wang, X., Li, Y., Wu, L., Xiao, S., Ji, Y., Tan, Y., ... & Zhang, G. (2021). Dysregulation of the gut-brain-skin axis and key overlapping inflammatory and immune mechanisms of psoriasis and depression. *Biomedicine & Pharmacotherapy*, *137*, 111065. sciencedirect.com
- Wang, Y., Wang, X., Gu, X., Pan, J., Ouyang, Z., Lin, W., ... & Su, J. (2023). Evidence for a causal association between psoriasis and psychiatric disorders using a bidirectional Mendelian randomization analysis in up to 902,341 individuals. *Journal of Affective Disorders*, *337*, 27-36. [HTML]
- Weiglein, A., Gaffal, E., & Albrecht, A. (2022). Probing the skin–brain Axis: New Vistas using mouse models. *International Journal of Molecular Sciences*, *23*(13), 7484. mdpi.com
- Wu, M., Zeng, S., Zhang, Y., Liu, Y., Li, B., Yi, X., ... & Zhu, X. (2024). Disease Burden and Coping Strategies of Spouses of Patients with Psoriasis: A Qualitative Study. *Journal of Multidisciplinary Healthcare*, 1653-1662. tandfonline.com
- Yang, F., Zhang, Q., Song, D., Liu, X., Wang, L., & Jiang, X. (2022). A cross-sectional study on the relationship between rosacea severity and quality of life or psychological state. *Clinical, Cosmetic and Investigational Dermatology*, 2807-2816. tandfonline.com
- Yang, J., Zhang, S., Wu, Q., Chen, P., Dai, Y., Long, J., ... & Lin, Y. (2024). T cell-mediated skin-brain axis: Bridging the gap between psoriasis and psychiatric comorbidities. *Journal of Autoimmunity*, *144*, 103176. [HTML].

- Zhang, H., Wang, M., Zhao, X., Wang, Y., Chen, X., & Su, J. (2023). Role of stress in skin diseases: a neuroendocrine-immune interaction view. *Brain, Behavior, and Immunity*. sciencedirect.com
- Zhang, R., Zhou, L., Lv, M., Yue, N., Fei, W., Wang, L., ... & Zhang, J. (2022). The relevant of sex hormone levels and acne grades in patients with acne vulgaris: a cross-sectional study in Beijing. *Clinical, Cosmetic and Investigational Dermatology*, 2211-2219. tandfonline.com
- Zhao, F., Zhu, J., Yu, R., Shao, T., Chen, S., Zhang, G., & Shu, Q. (2022). Cutaneous adverse events in patients treated with PD-1/PD-L1 checkpoint inhibitors and their association with survival: a systematic review and meta-analysis. *Scientific Reports*, *12*(1), 20038. nature.com
- Zusman, E. Z., Howren, A. M., Park, J. Y., Dutz, J., & De Vera, M. A. (2020, December). Epidemiology of depression and anxiety in patients with psoriatic arthritis: a systematic review and meta-analysis. In *Seminars in Arthritis and Rheumatism* (Vol. 50, No. 6, pp. 1481-1488). WB Saunders. [HTML].