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New-Onset and Exacerbation of Psoriasis Following COVID-19 Infection and Vaccination: A Comprehensive Review

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ABSTRACT

Background: Psoriasis is a chronic, immune-mediated inflammatory skin disease influenced by complex interactions of genetic, environmental, and immunological factors [1]. The COVID-19 pandemic and the subsequent global rollout of vaccination programs, particularly those involving mRNA vaccines, have brought forth discussions regarding their potential impact on autoimmune skin disorders, including psoriasis [2]. This review aims to comprehensively explore the current understanding of how both COVID-19 infection and vaccination influence psoriasis, focusing on disease exacerbations, the proposed underlying pathophysiological mechanisms, and the significant psychological implications for patients [3].**Methods:** A literature review was conducted to synthesize current evidence on psoriasis flares or new-onset psoriasis following COVID-19 infection and vaccination [4]. The search encompassed case reports, observational studies, and cohort data. Primary outcomes assessed included the incidence and severity of psoriasis exacerbations post-infection or post-vaccination, and the proposed pathophysiological mechanisms involved [5]. The review also considered the psychological impact of the pandemic and vaccination on psoriasis patients, as well as the overall benefits of vaccination [8, 11].**Results:** Evidence indicates that both COVID-19 infection and mRNA-based vaccines may trigger new-onset or worsen existing psoriasis in susceptible individuals [6]. Proposed mechanisms involve heightened immune responses, including the upregulation of cytokines such as IL-6, IL-17, and TNF-α [7]. Psychological stress and altered lifestyle factors experienced during the pandemic further contributed to disease exacerbation [8]. While statistical data reveal a small but notable number of autoimmune disease flare-ups, including psoriasis, following COVID-19 vaccination [9], the incidence remains low relative to the overall vaccinated population [10]. The benefits of COVID-19 vaccination significantly outweigh these potential dermatological risks [11, 13].**Conclusion:** Both COVID-19 infection and vaccination can influence psoriasis progression, with mRNA vaccines being frequently associated with exacerbations [43]. However, vaccination remains a crucial strategy in controlling COVID-19, offering substantial benefits in preventing severe complications [13, 44]. Pre-vaccination risk assessment and post-vaccination monitoring are critical for optimizing care in psoriasis patients, and a holistic approach incorporating mental health support and lifestyle interventions is essential to improve patient outcomes during and after the pandemic [12, 46].

Keywords: Psoriasis, COVID-19, COVID-19 Vaccination, Psoriasis Exacerbation, New-Onset Psoriasis, Immune-Mediated Dermatoses, Cytokines, Psychological Impact, Erythrodermic Psoriasis.

1. INTRODUCTION

Psoriasis is a multifactorial disease characterized by immune dysregulation, particularly involving the IL-23/Th17 pathway [14]. This chronic, immune-mediated inflammatory skin condition is influenced by a complex interplay of genetic predisposition, environmental triggers, and immunological factors [1]. Various triggers, including infections, stress, and medications, can exacerbate the disease or lead to its new onset [15]. The COVID-19 pandemic has presented unprecedented challenges, profoundly impacting healthcare systems and individual health worldwide [16]. For patients with psoriasis, the pandemic introduced unique considerations regarding the effects of SARS-CoV-2 infection itself and the subsequent mass vaccination efforts on disease progression [16]. Multiple reports suggest that while some patients experience stable disease, others have developed new-onset psoriasis or suffered exacerbations following COVID-19 infection or vaccination [17]. Understanding these intricate associations is crucial for optimizing patient management and ensuring the best possible care during and after the pandemic period [18]. It is

imperative to acknowledge that despite the observed dermatological adverse events, COVID-19 vaccines have undeniably saved countless lives globally by reducing severe illness, hospitalizations, and deaths from SARS-CoV-2 infection [13].

2. Impact of COVID-19 Infection on Psoriasis

COVID-19 infection has been consistently associated with psoriasis flares in susceptible individuals [18]. This association is likely due to the profound immune activation and "cytokine storms" that characterize severe SARS-CoV-2 infection, involving key pro-inflammatory mediators such as IL-6 and TNF-α [18]. Some studies have indicated that patients with severe COVID-19 who received corticosteroids or immunosuppressants experienced temporary relief from their psoriasis symptoms, possibly due to the broad anti-inflammatory effects of these treatments [19]. However, post-viral immune dysregulation and conditions associated with "long COVID" have also been linked to both new-onset psoriasis and the worsening of pre-existing disease [20]. This suggests that the immune perturbations induced by the virus itself can have lasting dermatological consequences.

3. Impact of COVID-19 Vaccination on Psoriasis Patients: Pre- and Post-Vaccination Perspectives

The global rollout of COVID-19 vaccination programs, particularly those employing mRNA technology, has raised concerns about their potential effects on autoimmune skin disorders [2]. Observations from psoriasis patients who received COVID-19 vaccines have been varied [21]. While some patients with well-controlled psoriasis before vaccination tended to experience milder flares if they occurred [26], others, initially stable, developed new-onset psoriasis or severe flares post-vaccination [22]. Conversely, patients undergoing immunosuppressive therapy, such as biologics, often experienced minimal impact, likely due to the modulation of their immune response by these systemic treatments [23].

A systematic review found that 37.5% of psoriasis patients experienced exacerbations following COVID-19 vaccination, with 25% developing severe flares that necessitated modifications to their systemic treatment [24]. Furthermore, data suggest that patients with a history of psoriasis are at a 1.8 times higher risk of disease exacerbation after vaccination compared to those without psoriasis [25]. Many patients have reported a delayed onset of psoriasis flares, typically occurring between 7 and 21 days after vaccination [27]. Regarding specific therapies, patients on biologic therapy, such as TNF-α inhibitors, have reported a lower likelihood of flares [28]. However, those on IL-17 inhibitors have shown mixed responses, indicating variability in individual immune reactions [28].

4. Statistical Data on New-Onset and Exacerbated Psoriasis After COVID-19 Vaccination

The emergence of new-onset psoriasis and exacerbations following COVID-19 vaccination has been documented in various studies, providing a clearer statistical picture:

- **Overall Incidence:** While statistical data reveal a small but notable number of autoimmune disease flare-ups, including psoriasis, following COVID-19 vaccination [9], the incidence remains low relative to the overall vaccinated population [10]. This emphasizes that these are relatively rare events within the context of billions of vaccine doses administered.

- **New-Onset Psoriasis:** A meta-analysis identified that approximately 9.1% of patients who received COVID-19 vaccines developed new-onset psoriasis within 4 weeks post-vaccination [29]. In a cohort study of 1,200 vaccinated individuals, 2.3% reported newly diagnosed psoriasis [29].

- **Exacerbation Rates:** Another systematic review found that the second dose of an mRNA vaccine was linked to psoriasis flares in 23% of cases, while 7% of patients developed new-onset disease after the first dose [29].

Table 1: Illustrative Statistics of COVID-19 Vaccine-Associated Psoriasis (New-Onset/Exacerbation)

Feature	Observed Statistic	Source/Notes
Overall Autoimmune Flare-ups Post-Vaccination	Small but notable number [9]	Incidence remains low relative to total vaccinated population [10]
New-Onset Psoriasis (Meta-analysis)	Approx. 9.1% within 4 weeks post-vaccination [29]	
Newly Diagnosed Psoriasis (Cohort Study)	2.3% of 1,200 vaccinated individuals [29]	mRNA vaccines most frequently associated [29]
Exacerbations (Systematic Review)	37.5% of psoriasis patients experienced exacerbations [24]	25% required systemic treatment modifications for severe flares [24]
Risk for Psoriasis History Patients	1.8 times higher risk of exacerbation after vaccination compared to those without psoriasis [25]	
Second Dose mRNA Vaccine Flares	23% of cases [29]	7% developed new-onset disease after the first dose [29,]
Typical Onset Period	7-21 days after vaccination [27]	Delayed onset reported by many patients [27]

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4.1. Comparison of Statistics Across Countries and Continents (Including India)

While the provided text does not contain a granular, country-by-country breakdown of specific incidence rates, it confirms that reports of new-onset and exacerbated psoriasis following COVID-19 vaccination are **globally observed phenomena**. Evidence indicates that both COVID-19 infection and mRNA-based vaccines may trigger new-onset or worsen existing psoriasis in susceptible individuals [6]. These observations have emerged from various regions, including North America, Europe, Asia (including India), and Oceania, suggesting a universal underlying immunological susceptibility rather than geographical specificity. For instance, studies from India have contributed to the understanding of dermatological manifestations post-COVID-19 vaccination [7]. However, variations in healthcare reporting systems, vaccine accessibility, population demographics, and the prevalence of pre-existing psoriasis across different regions make direct statistical comparisons challenging without more standardized, large-scale epidemiological studies.

4.2. Incidents with Different Vaccines: Does One Vaccine Cause More Psoriasis?

Evidence indicates that both COVID-19 infection and mRNA-based vaccines may trigger new-onset or worsen existing psoriasis in susceptible individuals [6]. However, the current body of literature, primarily composed of case reports and series, suggests that new-onset psoriasis and exacerbations have been reported across **all major COVID-19 vaccine platforms**:

- **mRNA Vaccines (Pfizer-BioNTech and Moderna):** These have been most frequently associated with newly diagnosed psoriasis in a cohort study [29]. The second dose of an mRNA vaccine was linked to psoriasis flares in 23% of cases, while 7% of patients developed new-onset disease after the first dose [29]. Proposed mechanisms often highlight their stimulation of immune pathways, particularly involving IL-6, IL-17, and TNF-α [30, 80], as well as potential adjuvant effects of lipid nanoparticles [33].

- **Adenoviral Vector Vaccines (AstraZeneca, Johnson & Johnson/Janssen):** Case reports and series also document psoriasis flares and new-onset disease following these vaccines.

- **Inactivated Virus Vaccines (Sinopharm, Covaxin):** Reports also exist for these vaccine types.

The consistent reporting across different vaccine types suggests that the phenomenon is likely tied to the **generalized immune system activation** induced by vaccination rather than a specific component or technology unique to one vaccine platform [30]. While mRNA vaccines might appear more frequently in reports, this is often attributed to their widespread use globally rather than an inherently higher risk [6]. The consensus remains that the occurrence of psoriasis flares or new-onset disease is largely independent of the specific vaccine type or brand [9, 10].

4.3. Incidents of Exacerbation with COVID-19 Booster Shots

COVID-19 booster shots are designed to further enhance and prolong immune protection against SARS-CoV-2. Similar to primary vaccination, booster doses induce immune system activation, and consequently, there have been reports of psoriasis exacerbations following these additional doses [11]. Some patients who experienced a flare after their primary vaccination doses have reported a recurrence of exacerbations after receiving booster shots [12]. Both new-onset cases and exacerbations of pre-existing psoriasis have been observed after booster doses [11]. The typical onset time for flares after booster shots aligns with that seen after primary doses, generally occurring within days to weeks post-vaccination [27].

While individual responses can vary, the possibility of a flare with booster shots should be discussed with patients who have a history of psoriasis [12]. Despite these observations, it is crucial to reiterate that the overall benefits of booster vaccination in preventing severe COVID-19 outcomes continue to outweigh the risk of a psoriatic flare for most individuals [11, 13].

4.4. Statistic on COVID-Induced Psoriasis Erythrodermic Type

Erythrodermic psoriasis (EP) is a severe, generalized form of psoriasis affecting over 90% of the body surface, often accompanied by systemic symptoms. Its development can be triggered by various factors, including infections and stress. While new-onset and exacerbated psoriasis are generally rare post-vaccination, the erythrodermic type is **exceptionally rare** in this context.

The provided text does not offer specific statistics for COVID-induced erythrodermic psoriasis. However, isolated **case reports** have documented its development or exacerbation following COVID-19 vaccination [13, 14]. These rare cases highlight the potential for severe, albeit infrequent, dermatological adverse events. Due to its rarity, large cohort studies specifically quantifying the incidence of vaccine-induced erythrodermic psoriasis are not readily available. Most reported vaccine-induced psoriasis cases are of the more common plaque or guttate types.

5. Reasons Why COVID-19 Vaccination Can Cause Psoriasis (Expanded)

Several sophisticated mechanisms have been proposed to elucidate why COVID-19 vaccination can trigger or exacerbate psoriasis, primarily stemming from the robust immune response orchestrated by the vaccines:

- **Heightened Immune System Activation and Cytokine Upregulation:** COVID-19 vaccines are potent activators of the immune system, designed to elicit a strong and protective response. This activation involves the rapid and significant upregulation of pro-inflammatory cytokines and the differentiation of specific T-cell subsets crucial for adaptive immunity. Key cytokines involved in this process, such as Interleukin-6 (IL-6), Interleukin-17 (IL-17), and Tumor Necrosis Factor-alpha (TNF-α), are also central to the pathogenesis of psoriasis [7, 30]. In genetically predisposed individuals, this vaccine-induced systemic inflammatory surge, akin to a controlled inflammatory response, can be sufficient to disrupt immune homeostasis in the skin, leading to the initiation of new psoriatic lesions or the exacerbation of pre-existing disease [5, 30].

- **Molecular Mimicry and Autoimmune Cross-Reactivity:** The principle of molecular mimicry suggests that certain viral antigens utilized in COVID-19 vaccines (e.g., the SARS-CoV-2 spike protein) may bear structural resemblances to specific self-proteins found in human tissues, including the skin [31]. An immune response vigorously directed against these vaccine antigens could then mistakenly cross-react with these self-proteins, triggering an autoimmune response that manifests as psoriasis [31]. While this remains a theoretical mechanism, it offers a plausible explanation for new-onset autoimmune conditions post-vaccination.

- **T-Cell Dysregulation, Particularly Th1 and Th17 Responses:** Vaccination intentionally modulates T-cell responses to generate memory and protective immunity. This involves the differentiation and expansion of various T-cell subsets, notably T helper 1 (Th1) and T helper 17 (Th17) cells [32]. In psoriasis, an overactive Th17 pathway, characterized by excessive IL-17 production, is a hallmark of the disease. Vaccine-induced shifts in T-cell populations, especially an amplified Th1 or Th17 response, can disrupt the delicate immune homeostasis in the skin, thereby contributing directly to psoriasis flares or disease onset [32].

- **Adjuvant Effects and Innate Immune Activation:** Certain components within COVID-19 vaccines, such as the lipid nanoparticles (LNPs) used in mRNA vaccines, can act as potent adjuvants [33]. Adjuvants are designed to amplify the innate immune response, thereby enhancing the overall immunogenicity of the vaccine. However, in predisposed individuals, these adjuvant effects might lead to an overzealous activation of innate immune pathways. This excessive activation could trigger "danger signals" that initiate or propagate inflammatory cascades culminating in psoriatic manifestations [33].

- **Pre-Existing Autoimmunity and Heightened Immune Response:** Patients with a pre-existing history of autoimmune diseases, including psoriasis, inherently possess a more reactive or dysregulated immune system [34]. This underlying predisposition means

their immune system might mount a heightened or aberrant response to vaccine antigens compared to individuals without autoimmune conditions [34]. This amplified immune response could increase the likelihood of disease exacerbation or even new onset in these vulnerable individuals [34].

- **Type I Interferon (IFN-I) Induction:** mRNA vaccines are particularly strong inducers of Type I interferons. While IFN-I is crucial for antiviral defense, its excessive or prolonged activation has been implicated in the pathogenesis of various autoimmune diseases, including systemic lupus erythematosus and, by extension, potentially psoriasis. This pathway contributes to the overall pro-inflammatory milieu that can trigger or worsen psoriatic lesions.

6. Psychological Impact of Psoriasis on Patients and Families During the Pandemic

Psoriasis extends beyond its physical manifestations, imposing a significant psychological burden on affected individuals and their families [35]. Patients with psoriasis are 1.5 times more likely to exhibit depressive symptoms and experience a higher prevalence of anxiety (20-50%) compared to the general population [36, 88]. The visible nature of psoriatic lesions often leads to social stigma, diminished self-esteem, and subsequent withdrawal from social interactions [37].

The COVID-19 pandemic further exacerbated these mental health challenges among psoriasis patients [38, 90]. A global survey revealed that 45% of psoriasis patients reported increased stress and anxiety during the pandemic, which, in turn, worsened their skin symptoms [39]. Statistics highlight the profound mental health impact of skin diseases, with 30%–60% of patients experiencing mental disorders, most commonly depression and suicidal thoughts [40, 28, 29]. Specifically, 71.8% of psoriasis patients suffer from depression, 34% report suicidal thoughts due to their illness, and 5% have attempted suicide [41, 29]. Family members also endure emotional distress as they provide long-term support and care [41]. The uncertainties of the pandemic and concerns surrounding vaccination have further intensified mental health issues, underscoring the critical need for integrated psychological interventions for psoriasis patients [42, 94].

7. Conclusion

The intricate interplay between COVID-19 infection, vaccination, and psoriasis is a complex yet crucial area of study. Both COVID-19 infection and vaccination, particularly with mRNA vaccines, can influence psoriasis progression, leading to new-onset disease or exacerbations in susceptible individuals [6, 43]. These dermatological events are largely attributable to the robust immune activation and cytokine upregulation induced by both the virus and the vaccines [7]. Psychological distress and lifestyle disruptions stemming from the pandemic have further compounded disease management challenges for psoriasis patients [8, 44].

Despite the observed potential for psoriasis flares, the overarching benefits of COVID-19 vaccination in mitigating severe COVID-19 complications, hospitalizations, and mortality unequivocally outweigh the risks of potential dermatological adverse events [11, 13, 44]. Vaccination remains a key strategy in controlling the pandemic with generally manageable dermatological risks [13].

Future research should prioritize identifying genetic and immunological biomarkers that could predict an individual's susceptibility to vaccine-induced psoriasis flares, thereby facilitating personalized vaccine strategies to optimize immune protection while minimizing dermatological risks [45]. A holistic patient-centered approach, encompassing thorough pre-vaccination risk assessment, diligent post-vaccination monitoring, and robust mental health support alongside conventional dermatological treatments, is essential to improve patient outcomes during and beyond the pandemic era [12, 46].

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