Telogen Effluvium Post Covid-19 Infection And Vaccination: A Narrative Review.

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Abstract
Telogen effluvium (TE) is a common and well-recognized form of non-scarring hair loss, characterized by diffuse shedding that typically arises in response to physiological or psychological stressors. This review delves into the prevalence, clinical presentation, and risk factors associated with TE in the context of COVID-19 infection and vaccination. TE following COVID-19 infection has emerged as a significant concern, Factors such as female gender, severe COVID-19 disease, and pre-existing conditions, such as autoimmune disorders, vitamin deficiencies, and a personal history of TE-are notable predictors of both susceptibility and severity, highlighting the multifactorial nature of this condition.
Conversely, TE associated with COVID-19 vaccination appears to be far less common, with cases generally presenting as milder and self-limiting. These findings underscore the distinct differences in clinical patterns between TE linked to infection and vaccination. While the existing evidence provides valuable insights, further research is essential to clarify the underlying mechanisms, refine therapeutic approaches, and ultimately enhance outcomes for those affected by TE in the evolving context of the COVID-19 pandemic.
Keywords: *Telogen effluvium, Covid-19, vaccination, post covid, hair loss.*

I. Introduction

Telogen Effluvium (TE) is the most common type of hair shedding [1]. It is a widespread non-scaring alopecia characterized by excessive hair shedding resulting from disruptions in the normal hair growth cycle. TE typically arises following physiological or psychological stressors, such as acute illnesses, nutritional deficiencies, hormonal imbalances, or surgical interventions [2]. During the COVID-19 pandemic, an increasing number of TE cases have been reported, making it one of the most frequently observed dermatological sequelae associated with SARS-CoV-2 infection[3-4]. This trend highlights the complex interplay between systemic inflammation, psychosocial stress, and COVID-19-related disruptions as potential contributors to hair loss.

The pathophysiology of TE post-COVID appears to diverge from traditional TE mechanisms. COVID-19-induced TE is thought to result from abrupt anagen-to-telogen transitions triggered by cytokine storms, fever, and immune dysregulation [4-6]. Additionally, demographic and clinical factors, including female gender, pre-existing conditions such as vitamin D deficiency or thyroid dysfunction, and disease severity, have been identified as significant risk factors for TE in COVID-19 patients [7-8]. While TE post-COVID infection often presents as more severe, cases linked to COVID-19 vaccination appear milder and self-limiting, with most resolving within a few months [9-10].

This narrative review consolidates evidence from 32 studies exploring the prevalence, clinical presentation, and underlying mechanisms of COVID-19-associated TE. The aims of the review are:
1. To determine the prevalence of TE in patients following COVID-19 infection or vaccination.
2. To describe the demographic and clinical characteristics of individuals with TE post-COVID.
3. To evaluate factors predicting the development and severity of TE in this context.
4. To compare COVID-19-associated TE with vaccination-related TE in terms of presentation, severity, and recovery.

By synthesizing this evidence, this review aims to provide a comprehensive understanding of COVID-19-associated TE and inform clinical approaches for prevention and management.

II. Methods

Search Strategy

A comprehensive search of the PUBMED database was conducted using the keywords 'COVID-19' OR 'Coronavirus-19' AND 'Telogen Effluvium' OR 'TE.' The search included all articles published from the

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inception of the database until December 2023. A total of 88 articles were identified. After screening for relevance to the research topic, 32 primary studies were shortlisted for detailed analysis.

Screening Process

The initial screening of titles and abstracts was performed independently by two reviewers to ensure objectivity and minimize bias. Full-text articles were then assessed based on predefined inclusion and exclusion criteria. Disagreements during the screening process were resolved through discussion.

Inclusion and Exclusion Criteria in Table 1:

Table 1: Inclusion and Exclusion Criteria	
Inclusion criteria	**Exclusion Criteria**
Reported cases or characteristics of Telogen Effluvium in patients diagnosed with or recovering from COVID-19	Did not focus on Telogen Effluvium in the context of COVID-19.
Provided data on patient demographics, clinical presentation, or outcomes related to TE post-COVID.	Were not available in English.
Were Published in peer-reviewed journals.	Were editorials, opinion pieces, or preprints without peer review

Data from the selected studies were extracted to focus on the following (as summarized in Table 2):

Table 2: Data Extraction and Analysis	
Prevalence	Number of reported Telogen Effluvium cases post-COVID.
Patient Characteristics	Demographics, clinical presentation, severity of COVID-19, and comorbidities
Correlation with COVID-19	Examining factors that may predict the development of Tolegen Effluvium, such as disease severity, duration of illness, or psychosocial stressors.

The extracted data were synthesized to identify patterns and correlations between COVID-19 and Telogen Effluvium, aiming to elucidate predictive factors for developing TE.

Quality Assurance

The quality of the included studies was evaluated based on relevance, methodological rigor, and reporting clarity. Any limitations or biases in the studies were documented to provide a balanced interpretation of the findings.

III. Results

Data from the selected studies were extracted and categorized into three main aspects: prevalence of Telogen Effluvium (TE) post-COVID, patient characteristics, and factors predicting the development of TE. The findings are summarized in Tables 3-6

Prevalence of TE Post-COVID

The prevalence of TE varied widely across studies, reflecting differences in study populations and methodologies. TE was reported in 24-85% of patients post-COVID, with the onset of hair shedding occurring approximately 30-57 days after infection. Most cases resolved spontaneously within 3-6 months. The findings are summarized in Table 3.

Table 3: Prevalence of TE Across Studies				
Study	**Population**	**TE Prevalence**	**Onset (Days Post-Infection)**	**Resolution Time**
Kutlu et al., 2023 [3]	2,171 post-COVID patients	85%	~45	Not reported
Moreno-Arrones et al., 2021 [4]	214 acute TE patients	89% (COVID-related)	57.1	3–6 months
Ammar et al., 2024 [10]	2,000 vaccinated individuals	24%	< 60	6 months
Aksoy et al., 2021[11]	204 post-COVID patients	36.7%	54	4–5 months
Al Dahish et al., 2023 [12]	561 general participants	73.3%	~30	Not reported
Bukhari et.al., 2023[13]	392 general participants	59.70%	~90	3 – 6 months

Patient Characteristics

TE predominantly affected females, with age, comorbidities, and COVID-19 severity emerging as key factors (Table 4). Severe COVID-19 cases, particularly those requiring hospitalization or intensive treatments, showed higher prevalence and severity of TE.

Table 4: Patient Characteristics Associated with TE			
Study	**Key Demographics**	**Comorbidities**	**Covid-19 severity**
Abdulwahab et al., 2022 [7]	86.7% females	Not reported	Higher TE prevalence in severe cases
Babaei et al., 2021 [8]	Predominantly females, younger onset	Vitamin D deficiency, hypothyroidism	Severe cases linked to greater hair loss
Olds et al., 2021 [14]	90% female patients	Not specified	70% hospitalized; 80% treated with antibiotics or corticosteroids
Asilian et al., 2024 [15]	No gender bias; higher with age	Not reported	Higher prevalence in outpatients
Starace et.al., 2021[16]	Predominantly females	Not reported	Severe cases linked to greater hair loss

Correlation with COVID-19

Physiological and psychological stressors associated with COVID-19 emerged as major contributors to TE. Severe disease, characterized by fever, respiratory symptoms, and cytokine storms, significantly increased the risk of TE. Stress and anxiety during the pandemic were also identified as aggravating factors [17]. (Table 5)

Table 5: Correlation Between COVID-19 and TE		
Study	**Predictive Factors for TE**	**Mechanisms**
Moreno-Arrones et al., 2021 [4]	Fever, respiratory symptoms	Cytokine-mediated inflammation, stress
Deng et al., 2021 [5]	Systemic inflammation, cytokine storms	Disruption of hair growth cycle
Sharquie & Jabbar, 2022 [18]	Stress, high fever	Hair matrix cell damage due to inflammation
Bostan & Cakir, 2023 [19]	Stress among healthcare workers	Psychosocial stress
Triwongwaranat et al., 2023 [20]	Female gender, weight loss	Systemic and immune-mediated disruptions

IV. Discussion

This narrative review consolidates evidence from 32 studies investigating the relationship between COVID-19 infection, vaccination, and Telogen Effluvium (TE). The findings provide a comprehensive understanding of the prevalence, clinical presentation, and potential underlying mechanisms of TE in the context of COVID-19. TE following COVID-19 infection is characterized by its earlier onset compared to classic TE, with evidence suggesting a strong association with systemic inflammation, disease severity, and psychosocial stressors triggered by the pandemic. These findings highlight the multifactorial nature of TE, where physiological and emotional stress contribute to the disruption of the hair growth cycle.

Furthermore, the review sheds light on TE associated with COVID-19 vaccination, which, although less common, presents as a mild and self-limiting condition. This distinction between infection-related and vaccination-related TE underscores the varied triggers and outcomes of this condition.

The prevalence of TE among post-COVID-19 patients ranged widely across studies, from 24% to 85%, reflecting variations in study populations and methodologies. A consistent observation, however, was the earlier onset of TE in COVID-19 patients compared to classic stress-induced TE, with hair shedding typically commencing 30-60 days post-infection. This shorter latency period suggests a distinctive pathophysiological mechanism, likely driven by abrupt anagen-to-telogen transitions mediated by heightened inflammatory responses and cytokine storms [4-5]. The role of systemic inflammation as a key trigger aligns with findings from prior studies on stress-related TE, underscoring the significant impact of physiological insults on hair follicle cycling.

Gender consistently emerged as a significant risk factor for COVID-19-associated TE, with women disproportionately affected across multiple studies [7,14]. This may be explained by hormonal influences, including estrogen's regulatory effects on the hair growth cycle, as well as the greater psychosocial burden experienced by women during the pandemic [19]. In contrast, age-related patterns were inconsistent, with some studies suggesting faster recovery in younger individuals, while others identified no significant association between age and TE prevalence [15,18]. These discrepancies highlight the need for larger, population-based studies to elucidate demographic trends.

The severity of COVID-19 infection was a critical determinant of TE prevalence and presentation. Patients with severe disease, particularly those requiring hospitalization or intensive therapies such as corticosteroids and antibiotics, exhibited higher rates of TE [3,14]. Fever and respiratory symptoms emerged as key triggers, reinforcing the role of systemic inflammation and stress in exacerbating hair loss [4]. Interestingly, vaccination-induced TE, although less common, followed a milder and self-limiting course, with most cases resolving within 3-6 months [10, 21]. This distinction underscores the relative safety of COVID-19 vaccines and their limited impact on hair health, providing reassurance to patients and clinicians alike.

Pre-existing conditions, such as autoimmune disorders (e.g., thyroid dysfunction) and nutritional deficiencies (e.g., vitamin D), were frequently associated with more severe TE presentations [7,8]. A prior history

of TE further increased susceptibility to significant hair shedding post-COVID-19, suggesting that underlying vulnerabilities may amplify the effects of systemic and psychological stressors. These findings underscore the importance of optimizing the management of modifiable risk factors in susceptible populations to mitigate TE severity.

Comparing TE associated with COVID-19 infection and vaccination revealed notable differences. TE following COVID-19 infection often had a more severe presentation due to the combined effects of systemic inflammation, fever, and stress. Conversely, vaccination-associated TE was generally milder, self-limiting, and less prevalent, with cases typically resolving within months [9-10]. These observations are consistent with prior reports, reinforcing the benign nature of vaccination-induced TE and supporting public health efforts to advocate for COVID-19 vaccination.

Clinically, these findings highlight the importance of patient education and early intervention. Physicians should counsel patients on the transient nature of COVID-19-associated TE, alleviating unnecessary anxiety and promoting adherence to treatment plans. Identifying high-risk groups, such as women, individuals with severe COVID-19, and those with pre-existing conditions, can facilitate targeted monitoring and personalized management strategies. Additionally, vaccination advocacy should emphasize the rarity and benign course of post-vaccination TE to address concerns about vaccine safety.

This review also identifies significant limitations in the existing literature. Many studies relied on small sample sizes, retrospective designs, and self-reported outcomes, introducing potential biases and limiting generalizability. The lack of standardized diagnostic criteria and grading scales for TE further constrained direct comparisons between studies. Short follow-up durations precluded comprehensive assessments of long-term outcomes and recovery trajectories. Future research must address these gaps to enhance the robustness of findings and inform clinical practice.

Despite these limitations, this review provides a comprehensive overview of COVID-19-associated TE, offering insights consistent with prior literature on stress-related hair loss. Notably, it highlights unique features of COVID-19-associated TE, including its earlier onset, higher prevalence among women, and differential presentation compared to vaccination-related TE. These findings contribute to a growing body of evidence on the broader dermatological manifestations of COVID-19 and its impact on quality of life.

Future research should focus on elucidating the molecular mechanisms underlying COVID-19-associated TE, particularly the roles of cytokines and systemic inflammation. Longitudinal studies tracking recovery trajectories and recurrence rates are essential for understanding long-term outcomes. Additionally, innovative therapeutic interventions, such as stem cell serums for refractory cases, warrant robust evaluation. Population-specific studies exploring geographic and ethnic variations in TE prevalence and severity would also provide valuable insights.

V. Conclusions

This review highlights the high prevalence of Telogen Effluvium (TE) among COVID-19 patients, with an earlier onset associated with systemic inflammation, psychosocial stress, and disease severity. Key risk factors for TE include female gender, comorbidities, and a history of TE. In contrast, TE linked to vaccination is less common, milder, and self-limiting, providing reassurance for patients and public health efforts.

While current research faces limitations such as small sample sizes and lack of standardized criteria, the findings emphasize the need for further studies. Future research should focus on understanding the underlying mechanisms of TE, exploring novel treatments for persistent cases, and examining population-specific variations to enhance overall patient care and outcomes.

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