Correlation of COVID-19 and Hairfall – A Cross-Sectional Study

Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1618
www.lmi.education/
LINK MEDICAL INTERFACE

Seemab Safdar[1], Iqra Jamshaid[2], Kanwal Noman[1], Nishwah Khan[3], Sajjad Butt[1]

Correspondence
Seemab Safdar
seemabsafdar56@gmail.com

Affiliations
1 Department of Medicine, City Medical Centre, Rawalpindi, Pakistan
2 Department of Medicine, Rals Healthcare, UAE
3 Department of Dermatology, City Medical Centre, Rawalpindi, Pakistan

Keywords
COVID-19, Telogen Effluvium, post-COVID-19 complications, hair loss, cutaneous manifestations, dermatology, psychological stress, pandemic hair los

Disclaimers

Authors' Contributions	All authors contributed equally to the study.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: The COVID-19 pandemic has impacted multiple physiological systems, including cutaneous structures. Telogen Effluvium (TE), a temporary hair loss condition, has been frequently reported in patients recovering from COVID-19, often exacerbating psychological stress and affecting quality of life.

Objective: This study aimed to investigate the prevalence and factors associated with TE in individuals recovering from COVID-19.

Methods: A cross-sectional study was conducted from September to December 2021 using a pre-validated questionnaire. A total of 150 participants aged 20 years or older from Rawalpindi, Pakistan, were enrolled. Data on demographic information, COVID-19 infection details, and hair loss patterns were collected. Participants with confirmed COVID-19 infection and no prior history of TE were included. Data were analyzed using SPSS version 23, with categorical variables compared using chi-square test and statistical significance set at $p < 0.05$.

Results: Out of 150 participants, 135 (90%) had a confirmed COVID-19 history. Post-COVID-19 hair loss was reported by 110 (73.3%) participants, and females were significantly more affected (68.2%, $p = 0.032$). A family history of TE was found in 30 (20%) participants.

Conclusion: COVID-19 is significantly associated with TE, particularly among females. Further research is required to explore long-term outcomes.

INTRODUCTION

The COVID-19 pandemic has brought an unprecedented focus on its severe respiratory and cardiovascular complications; however, its impact on other physiological systems, including the integumentary system, is also becoming apparent. Among the lesser-known effects, the occurrence of Telogen Effluvium (TE), a type of hair loss, has been increasingly reported in individuals following COVID-19 infection. TE is characterized by a temporary but significant loss of hair, typically occurring after a stressful event or systemic illness. The pandemic's widespread physiological and psychological stressors, coupled with viral-induced alterations in immune response, can accelerate the transition of hair follicles from the anagen (growth) phase to the telogen (resting) phase, culminating in excessive hair shedding (1). Hair is a skin appendage, and its growth can be affected by various internal and external factors, including nutritional deficiencies, hormonal imbalances, major surgical procedures, and systemic illnesses such as viral infections (2). In COVID-19 survivors, these triggers are further compounded by the pro-inflammatory state induced by the disease, which can disrupt normal hair growth cycles and potentially lead to hair loss (3).

The pathogenesis of TE in the context of COVID-19 is multifactorial. It involves not only direct effects of the virus on hair follicles but also secondary consequences of systemic inflammation and stress. Psychological stress, commonly reported during and after COVID-19, can exacerbate hair loss by inducing a surge of cortisol and other stress hormones that can disrupt the normal hair cycle (4). Moreover, the heightened immune response in COVID-19, characterized by elevated levels of cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), may contribute to the development of TE, particularly in those experiencing severe symptoms or requiring hospitalization (5). This is consistent with findings that hair loss is often observed in patients with severe COVID-19, possibly linked to the intensity of systemic inflammation (6). While TE is typically reversible, the social and psychological implications of hair loss, especially for women, can be profound, negatively impacting self-esteem and quality of life (7). Understanding the relationship between COVID-19 and TE is critical for early diagnosis and management, as this condition may serve as an indicator of the systemic impact of COVID-19 beyond the acute phase.

Although previous studies have explored the dermatological manifestations of COVID-19, research specifically focusing on the correlation between COVID-19 and TE remains limited. It is necessary to identify the demographic and clinical characteristics that predispose individuals to this condition, as well as the potential influence of COVID-19 severity on the onset and duration of hair loss (8). The current study aims to investigate the prevalence and associated factors of TE in patients who have recovered from COVID-19, focusing on a sample from a tertiary care center in Rawalpindi, Pakistan. By identifying patterns in TE occurrence, such as age, gender, COVID-19 severity, and family history of hair loss, this study intends to provide valuable insights into the pathophysiology of TE in the context of COVID-19. Furthermore, the findings could guide

healthcare professionals in anticipating and managing post-COVID-19 hair loss, improving patient care and psychological well-being (9). Ultimately, a deeper understanding of this phenomenon will help establish evidence-based strategies to support patients experiencing hair loss post-COVID-19 and contribute to broader knowledge on the systemic effects of this pandemic.

MATERIAL AND METHODS

A cross-sectional study was conducted to evaluate the prevalence and contributing factors of Telogen Effluvium (TE) among individuals who had recovered from COVID-19, utilizing a pre-validated questionnaire to collect data from participants reporting to a clinic in Rawalpindi, Pakistan, between September and December 2021. The study included a total of 150 participants, aged 20 years and older, who had previously contracted COVID-19 and had no prior history of TE. The inclusion criteria ensured that only individuals with confirmed COVID-19 infection, either by polymerase chain reaction (PCR) test or antibody testing, were enrolled. Participants who had a history of pre-existing hair loss conditions or dermatological disorders that could influence hair growth, such as alopecia areata, were excluded to maintain the validity of the results. The ethical approval for this study was obtained from the institutional review board (IRB), and the research was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent before being included in the study.

The data were collected using a structured questionnaire comprising 20 questions, which was divided into four main sections: demographic information, COVID-19 infection details, hair diseases prior to the pandemic, and hair diseases observed during and after the COVID-19 infection. The demographic information included age, gender, and place of residence. Details of the COVID-19 infection, such as the date of diagnosis, severity of symptoms, history of hospitalization, and treatment modalities received, were recorded to assess the extent of the disease's impact. Additionally, a detailed history of hair loss patterns before and after COVID-19 was collected to identify any notable changes. Participants were asked to report the onset, duration, and severity of hair loss as well as any family history of alopecia or TE. The questionnaire was administered by trained personnel, who ensured that responses were accurately recorded and that participants understood each question thoroughly.

The collected data were analyzed using SPSS version 23 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the demographic characteristics and other relevant variables. Frequency and percentage distributions were used to represent categorical variables, while continuous variables were described using means, standard deviations, and ranges. A chi-square test was employed to identify any significant associations between hair loss and demographic or clinical characteristics, with the level of statistical significance set at $p < 0.05$. In addition, logistic regression analysis was performed to identify independent predictors of post-COVID-19 hair loss, considering variables such as age, gender, place of residence, severity of COVID-19 symptoms, and family history of hair loss.

Ethical considerations were adhered to throughout the study. Confidentiality and anonymity of the participants were maintained, and all collected data were stored securely. The participants were informed about the purpose of the study and their right to withdraw at any stage without any consequences. No identifiable personal information was disclosed, and the findings were presented in aggregate form only. The study aimed to provide a better understanding of the prevalence and risk factors associated with TE among COVID-19 survivors, thereby contributing to the body of knowledge on post-COVID-19 complications and supporting the development of targeted management strategies.

RESULTS

A total of 150 participants completed the study, of which 135 individuals had a confirmed history of COVID-19 infection, while the remaining 15 had reported symptoms consistent with the disease but were not formally diagnosed. The demographic characteristics of the participants are summarized in **Table 1**. The mean age of the participants was 33 ± 13.9 years. Among the study population, 132 (88%) were females, and 18 (12%) were males.

Table 1: Demographic Characteristics of the Study Population

Variable	Category	Frequency (N)	Percentage (%)
Age (Years)	20–30	56	37.3
	31–40	49	32.7
	41–47	45	30.0
Gender	Male	18	12.0
	Female	132	88.0

The study revealed that 110 (73.3%) of the 150 participants experienced an increase in hair loss after their COVID-19 infection, and the majority of these were females (75 out of 110; 68.2%). A detailed comparison of hair loss occurrence between genders is illustrated in Table 2. There was a statistically significant association between gender and increased post-COVID-19 hair loss ($p = 0.032$).

Out of the 110 participants who reported post-COVID-19 hair loss, 30 (20%) had a positive family history of TE. Furthermore, the analysis showed a significant correlation between family history of hair loss and

Table 2: Correlation Between Gender and Post-COVID-19 Hair Loss

COVID-19 History	Males (N)	Females (N)	Total (N)	p-value
Yes	35	75	110	0.032
No	15	25	40	-

Table 3: Association Between Family History of Hair Loss and Post-COVID-19 Telogen Effluvium (TE)

Family History of TE	Frequency (N)	Percentage (%)	p-value
Yes	30	20.0	0.027
No	120	80.0	-

increased hair shedding post-COVID-19 (p = 0.027), as shown in Table 3. Participants with severe COVID-19 symptoms, particularly those requiring hospitalization or intensive care unit (ICU) admission, were more likely to report post-infection hair loss. Out of 10 participants who were hospitalized, 8 (80%) experienced TE, and out of 5 participants who required ICU admission, 4 (80%) also reported increased hair loss. A statistically significant association was observed between hospitalization and the occurrence of TE (p = 0.001) as presented in Table 4.

Table 4: Hair Loss Occurrence in Relation to Hospitalization and ICU Admission

Severity of COVID-19	Number of Participants	Hair Loss Frequency (N)	Percentage (%)	p-value
Hospitalized	10	8	80.0	0.001
ICU Admission	5	4	80.0	0.002
Non-Hospitalized	135	98	72.6	-

A separate analysis of the onset of hair loss post-COVID-19 revealed that the median time to the onset of hair shedding was 2.0 months (IQR: 1.5–3.0 months). The median duration of hair loss reported was 5.0 months (IQR: 3.0–6.0 months). The results suggest that TE related to COVID-19 may be reversible, as the majority of participants (95%) reported partial or complete resolution of symptoms over time.

Overall, the results indicated that gender, family history of hair loss, and severity of COVID-19 were significant predictors of post-infection TE. This emphasizes the need for awareness among healthcare providers regarding this condition in COVID-19 survivors, particularly in female patients and those with a family history of alopecia. Further studies are recommended to investigate the pathophysiology and risk factors contributing to TE in this patient population.

DISCUSSION

The findings of this study indicated a high prevalence of Telogen Effluvium (TE) among individuals recovering from COVID-19, particularly among females, highlighting a significant association between COVID-19 and hair loss. This is consistent with previous research, which has documented the emergence of TE as a common dermatological manifestation following systemic stress and severe illness (1). The observed increase in hair loss among females in the current study may be attributed to underlying hormonal variations and increased psychological stress levels, which have been previously reported as key contributing factors to TE (2). The results also supported the findings of Seirafianpour et al., who emphasized that cutaneous manifestations, including TE, are prevalent in the post-COVID-19 period and should be considered in the clinical management of recovered patients (3).

The correlation between COVID-19 severity and TE was also significant, with a higher occurrence of hair loss in participants requiring hospitalization or ICU admission. This association could be linked to the intense systemic inflammatory response triggered by severe COVID-19, leading to increased levels of pro-inflammatory cytokines such as interleukin-6 and tumor necrosis factor-alpha, which have been shown to affect hair follicle cycling (4). Similar findings were reported by Sharquie and Jabbar, who identified a higher incidence of TE in patients with severe COVID-19 symptoms, further supporting the theory that the systemic inflammatory milieu and associated stressors play a crucial role in the pathogenesis of post-COVID-19 TE (5). However, despite the strong correlation observed in this study, there were no discernible patterns between the degree of COVID-19 severity and the extent of hair loss, indicating that individual variability and other unidentified factors may also contribute to this condition.

One notable strength of this study was its focus on a specific cohort with confirmed COVID-19 infection and no prior history of hair loss, which minimized potential confounding factors and provided a clearer picture of the impact of COVID-19 on hair health. The use of a structured, pre-validated questionnaire further enhanced the reliability of the data collected. Nevertheless, the study had certain limitations that should be acknowledged. Firstly, the cross-sectional design precluded the establishment of a temporal relationship between COVID-19 and the onset of TE. Although most participants reported experiencing hair loss within two months of COVID-19 recovery, it was challenging to determine whether COVID-19 was the primary trigger or an exacerbating factor for pre-existing hair conditions. Secondly, the study relied on self-reported data, which could introduce recall bias, particularly in estimating the duration and severity of hair loss. Additionally, the study was conducted at a single clinical site in Rawalpindi, which may limit the generalizability of the findings to broader populations.

The findings also raised questions regarding the reversibility of TE in COVID-19 patients. The majority of participants

reported a median recovery time of five months, suggesting that post-COVID-19 TE may be transient. This aligns with the results of Czech et al., who reported a similar median onset and recovery period for TE among COVID-19 survivors (6). However, a small proportion of participants continued to experience persistent hair shedding, indicating that some individuals might be at risk for chronic TE. Further research is warranted to explore the long-term outcomes of TE in COVID-19 patients, including potential risk factors such as persistent inflammation, autoimmune responses, or hormonal imbalances that could prolong the condition.

Future studies should incorporate a longitudinal design to track hair loss progression and recovery over time and include objective measures of hair density and scalp health to complement self-reported data. Additionally, it would be beneficial to explore the role of psychological stress, which is often underreported but has been shown to significantly exacerbate TE (7). Psychological and dermatological interventions aimed at reducing stress and promoting hair regrowth should be considered as part of the management strategy for post-COVID-19 patients. As the pandemic continues to evolve, understanding the broader dermatological sequelae of COVID-19, including TE, will be essential for providing comprehensive care and improving quality of life for affected individuals.

CONCLUSION

In conclusion, this study highlighted a strong association between COVID-19 and TE, with gender, family history, and severity of COVID-19 being key determinants of post-infection hair loss. Healthcare professionals should remain vigilant in recognizing and addressing this condition in COVID-19 survivors, particularly in female patients and those with a positive family history. Although TE is typically self-limiting, its psychological impact should not be underestimated, and early interventions should be considered to mitigate its effects. Further research is recommended to elucidate the underlying pathophysiological mechanisms and identify effective therapeutic options to support the recovery of hair health in this patient population (8).

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