

Association between COVID-19 Infection and Acute Telogen Effluvium

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ABSTRACT

COVID-19, the on-going pandemic has effected severely with the most common symptoms observed to be fever, cough, exhaustion and absence of taste sensation or olfaction are all common symptom of COVID-19.

Sore throat, aches and pains, headache, diarrhoea, maculopappular rash over skin, or discoloration of digits of upper or lower limb, red or irritated eyes, difficulties during breathing or shortness of breath, or disorientation, chest pain are some of the less prevalent ones.

Losses of speech or mobility are some of the serious symptoms that can be seen in COVID-19 infection. A total of about 258,164,425 cases, 5,158,211 deaths and many recoveries have been reported as per WHO. The recovered cases have shown various post COVID-19 sequel due to prolonged illness. Dyspnoea, insomnia, brain fogging, mi, DVT and has various skin manifestation telogen effluvium and others are seen. Non-scaring and diffuse hair loss is characteristic of acute TE, usually occurring 3 months after any stressful event like febrile illness, major surgery, nutritional deficiency and others that reasons the shedding of hair, which has been seen to last up to 6 months. TE has been seen to be associated with post SARS-CoV-2 infection. Excessive hair shedding after recovery, a hair pull test, bi-temporal widespread thinning and the absence of anisotrichosis in trichoscopy are all used to diagnose TE.

A strong association of this is marked with post SARS-CoV-2 infection. To see the association between COVID-19 infection and acute telogen effluvium in post SARS-CoV-2 recovered patients is main objective of this study. This article covers the related studies and the data.

Conclusion: SARS-CoV-2 infection is observed to be frequent and has proven to be a cause of acute telogen effluvium in post recovery patients. Hence, association between COVID-19 infection and TE as was seen in other febrile illness and systemic infection. Telogen effluvium has been noticed between thirty to ninety days after testing positive for this infection and reverting of normal hair pattern takes about 6-9 months.

Key words: COVID-19, Hair loss, Telogen effluvium

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INTRODUCTION

SARS-CoV-2, also known as the Corona virus sickness, is a global pandemic that began in December of 2019 in Wuhan, China (Hubei province) [1]. Since then, it has spread around the world, prompting WHO to designate it a public health emergency of international concern on January, 2020 and to recognise this as a pandemic on 11 March, 2020 [2]. COVID-19 has been identified as a disease involving multiple organ system with a wide spectrum of symptoms, most commonly fever, cough and fatigue, where seen as the symptoms while others include sputum production, headache, haemoptysis, diarrhoea, arthralgia,

difficulty in breathing, pain in chest, cognitive issues, lymphopenia and a deterioration in the quality of life [3,4].

NAAT, PCR, antigen and antibody testing were done by taking nasal or oral swab and even blood samples were used for investigation in COVID-19 patient [3]. Recovery of mild to moderate case of COVID-19 will take about 14 days and sometimes symptoms may remain for more than 20 days up to 45 days. Patients can development post-COVID complications due to its long term effect [5].

It's very important for these people who experience symptoms post COVID-19 recovery for follow up with their doctors to watch the organ functionality. The clinical symptoms typical of post COVID-19 recovery are tiredness, difficulty in breathing, autonomic dysfunction, brain fogging headache, loss of taste and anosmia for months, cough, depression, low grade fever, hyperglycaemia, orthostatic hypotension, fatigue

depression, palpitations, dizziness, muscle pain chest pain, joint pains and maculopapular rash [1,3,6].

Multi organ involvement in COVID includes clinical presentation involving cardiovascular (like MI), pulmonary (pulmonary fibrosis, haemothorax, mucormycosis, aspergillosis, yellow fungal infections), renal, neuropsychiatric organ systems (seizures, stroke), gastrointestinal tract (nausea, vomiting, loss of appetite, abdominal pain, pancreatitis) skeletal (arthritis). Although the longevity of these impact on the multi organ system is unknown. Initially no skin involvement was found during COVID infection; although some cases have lately been documented COVID-19 has recently been linked to vesicular, maculopapular, urticarial acroischemic lesions, telogen effluvium and other skin symptoms [7].

Hair loss that too typically after a febrile illness or sickness and because hyperthermia is frequently seen symptom of SARS-CoV-2, it is normal. Many patients post recovery had noticeable hair shedding and this type of hair is telogen effluvium.

Jainet, et al. stated that fever (33%), psychological stress (30%) and systemic illness (23%) were the leading reason of diffuse type of hair shedding in the study (here=100) [8].

Kligman described TE for the first time in 1961 and TE is the most frequent causes of alopecia that is observed to be characteristically diffuse type and typically of non-scarring type. Shedding of hairs, which has resulted from the entry of the hair into the shedding (telogen) phase, earlier is the prime cause. TE has been linked to a variety of triggers, including stressful events, endocrine disease, major surgery, febrile infection, drugs, nutritional deficiencies such as of iron deficiency certain medications and possible genetic predisposition [9]. Acute TE lasts shorter than approximately 180 days and begins 90-120 days after triggering event, but chronic TE lasts roughly for about a year.

At a time, in the hair growth cycle, +50-100 (normal) enters the shedding (telogen) phase. A hyperthermia or any illness can force more hairs to enter into this shedding phase and emotional stress can aggravated the entire scenario, which was experienced by the people during the COVID-19 pandemic. If the stressor persists, hair shedding can be long lived. Acute TE is seen to be self-limiting and hair growth is all of the same length by ones hairline in COVID-19 recovered patients [9,10]. The most conclusive technique to diagnose TE is by scalp biopsy.

Except for an increase in telogen follicles, TE biopsy results are normally normal (normal telogen counts 6-13%).

More than 15% of telogen follicles is suggestive with TE, but more than 25% is regarded a definite characteristic; however, biopsy is rarely performed in TE [10].

LITERATURE REVIEW

Studies: Khalifa E Sharquie, et al. in this observational and cross sectional study, evaluated that out of 39 diagnosed cases of ATE and RT-PCR confirmed and diagnosed cases of past SARS-CoV-2 infection, with 36 (92.3%) females and 3(7.69%) males, range of age being 22-67 years *i.e.* mean and standard deviation of 41.3, 11.6 years respectively. There were 15 individuals with mild symptoms (38.46%), 24 patients with moderate disease (61.53%) and none who required hospitalisation. Within 2-3 months of infection, all patients exhibited significant hair loss and hair pull tests were highly positive *i.e.* 10-15%, with mean of 35% of hair pulled away from the scalp. This recent SARS recent infection's effects on the hair development cycle were investigated and a link between COVID-19 and ATE was discovered [12].

Michela Starace, et al. A survey of 128 individuals revealed that 66.3% of the patients had TE and 58.4% had trichodynia. Trichodynia was shown to be linked to TE in 42.4% of cases. Hair signs and symptoms appeared in 62.5% of patients within the first month of the SARS-CoV-2 diagnosis, while in 47.8% of patients after twelfth weeks or more. As a result, how severe the post viral TE is, in patients who had a known history of COVID-19 infection have been affected by COVID-19 severity and was classified as early onset (four weeks) and late onset (>twelve weeks) Telogen Effluvium (TE) [13].

Fabio Rinaldi, et al. and Dermatol Ther (Heidelb), et al. stated that the storm of inflammation involved in COVID-19 infection and the psychological stressful conditions resulting from the then on going lock down situation had attributed to many skin and scalp conditions. An observational cross sectional study found alopecia relapse in 42.5% of patients involved in the study who were diagnosed with COVID-19 infection, while 12.5% reported alopecia relapse in the absence of the same. About 2 months after infection with COVID-19, a recurrence was noted. As a result, patients with alopecia who were also infected with COVID-19 experienced a significant relapse [14].

Dursun Turkmen, Nihal Altunisik, Serpil Sener, Cemil Colak, et al. in their study observed the possible effects of Coronavirus disease 2019 (COVID-19) in some dermatological aspects involving scalp and skin. Telogen Effluvium (TE), Alopecia Areata (AA) and Seborrheic Dermatitis (SD) were studied in individuals who had been in quarantine or in lock down for long time and the patients' and observed 27.9 percent of the participants were diagnosed with TE, 2.8 percent with alopecia on the scalp was observed, 2.5 percent with AA on the face, thus it was concluded that women had a greater TE before and during the outbreak. Thus it was concluded that then increase in psychosocial stress has a great impact in the course of numerous common "stress sensitive" skin conditions including TE [15].

Olds H, Liu J, Luk K, Lim HW, Ozog D, Rambhatla PV, et al. retrospectively reviewed an electronic medical records of

552 patients. These cases were laboratory confirmed or suspected COVID-19 infected individuals, 354 were females (64.1%) and rest being men (198) (35.9 percent). Maximum patients were either whites (262 patients, or 47.5 percent) or black (218 patients, 39.5 percent). They found ten patients who had been diagnosed with TE. Majority (90%) of the cases were female and black (60%). The hair shedding began after 50 days of the first symptom of COVID-19 infection. The main treatment for TE is to eliminate the triggering stressor by treating the underlying cause. As a result, managing the condition's self-limiting natural course is critical for management. Ultimately, hair shedding will stop and begin to regrow, although hair thickness may take up to 18 months to return to normal. The black cases reported are at more risk for TE after COVID-19 infection. This pandemic, causing psychosocial stress, which leads to additional rise in the prevalence of TE. Researchers couldn't tell exactly if the hair loss was caused entirely by the sickness or the medications used for treatment of COVID-19 [16].

Karolina Mieczkowska BS, Alana Deutsch BA and Caroline P, Halverstam MD, et al. in their article concluded that the patients who had previously been infected with SARS-CoV-2, generalised hair loss was found, which was clinically compatible with Telogen Effluvium (TE). Average age being 55, effecting volume of the hair and observed more in females. TE being self-limiting proper counselling and reassurance has to be done. Thus, TE was observed to be the sequel of COVID-19 [17].

Kriteeka Saini, Venkataram Mysore, et al. did a PubMed literature search and stated that vitamin D, regulates keratinocyte differentiation, proliferation and has major role in hair shedding as well as in the hair cycle. Vitamin D is involved in a variety of hair follicle development and differentiation mechanisms. In most research, serum vitamin D levels are concluded to be inversely related to mechanism. Alopecias of non-scarring type like Telogen Effluvium (TE) Androgenetic Alopecia, Alopecia Areata (AA) and even trichotillomania [18].

Alberto Ricci, Alessandra Pagliuca, Salvatore Sciacchitano, et al. stated that vitamin D levels were low in 80 percent of the cases, insufficient in 6.5 percent and normal in the remaining 20%. (13.5 percent). As a result, vitamin D insufficiency has been linked to have weakened the inflammatory response and increased lung involvement in SARS patients. Vitamin D testing during COVID-19 infection was useful tool for determining the therapy options. Thus a correlation can be found between vitamin D levels, COVID-19 infection and TE [19].

Hasan Aksoy, et al. Dermatol Ther, et al. studied 204 cases that had the history of SARS-CoV-2 infection. The study was to determine how frequent TE is, in post-COVID-19 patients, as well as to determine the relationship between the onset of TE and the severity of COVID-19, in order to determine whether psychological stress or medications are to blame for the onset of TE. The diagnosis of TE is based on complaint of significant hairloss, a pull test, widespread or bitemporal

thinning and the lack of anisotrichosis in trichoscopy. COVID-19 related TE (CATE) refers to patients who have no other reason for TE other than COVID-19 infection and those whose hair loss began post COVID recovery. TE was witnessed by 75 of the cases (36.7%) and 85 of Andro Genetic Alopecia (AGA) cases (41.7%). CATE was detected in 27.9% of the cases. Patients with CATE were statistically more common in hospitalised patients compared to outpatients, in women compared to males, in patients with raised blood pressure compared to those without the same and in patients with pulmonary symptoms compared to those without those. The period to onset of CATE, 2 months after the patient tested positive, was approximately one quarter of those who had COVID-19. It is not dissimilar to post infectious TE. COVID-19 patients are more likely to develop TE. Presence of AGA is linked to a more severe SARS-CoV-2 infection [20].

Nicolo Rivetti, Stefania Barruscotti, et al. Conducted a survey in Italy from March 9 to May 4 during the national quarantine. 25 female patients with previously diagnosed TE were invited to return for a follow up visit, claiming that their condition had gotten worse. All of the patients were Caucasian, with an average age of 36, disease duration of 4 to 24 months and were receiving treatment with hair loss preventing lotions, minoxidil and steroids topically along with the dietary supplements. Due to the epidemic and the quarantine, the majority of people's psychological reactions worsened (emotional weariness, worry, impatience and increased rage). Many common "stress responsive" skin disorders have been shown to be influenced by increased psychosocial stress test [21].

Giulio Rizzetto, et al. and Dermatol Ther, et al. in his report studied the various skin involvements in Coronavirus diseased patients, however Telogen Effluvium (TE) as a probable sequel of COVID-19, has been identified only in few studies. To explore patterns associated to COVID-19, fourteen cases of hair loss that occurred after infection, trichoscopy and trichogram were used. The trichoscopy, pull test and trichogram were all used for the clinical evaluation. Following SARS-CoV-2 infection, COVID-19 TE appeared after about 2 months (range 1-3 months). Hair loss lasted for five months on average (range 1-6 months). Trichoscopy revealed typical TE patterns. The ratio of telogen/anagen on the trichogram varied with variable being the time between the commencement of hair loss and the trichological visit [22].

DISCUSSION

Shuying Lv, Lei Wang, Xiaohui Zou, Zihan Wang, Baoquan Qu, Wenjun Lin and Dingquan Yang, et al. prepared a case report on a 38 year, female patient having acute telogen effluvium post COVID-19 infection. She revisited after recovery with presenting complain of massive hair loss in the past few weeks (>150 hairs/day), oily scalp and trichodynia were also noticed by her. Diffuse type of hair loss involving the entire scalp and no obvious patchy hair loss area and the forehead hairline not being significantly receded, were revealed on dermatological examination. Inflammation of scalp, dandruff, capillarectasia, increase in density of hair in

telogen phase and relatively uniform radius of the terminal hair shaft were observed on dermoscopic study. There were no traces of broken hair or black dots or even exclamation point hairs, etc. Topically 5 percent use of minoxidil mixed with halcinonide (solution) and selenium sulphide (lotion) mixed with shampoo were used for the treatment. The results were seen in 3 months, the hair loss was observed to be significantly in control; complaint of oily scalp and trichodynia were now seen to have disappeared. The percentage of TE cases reports in dermatology clinics were increased 5.51 times during pandemic as compared with the same season of the previous year, as observed in a study in Turkey [23].

Dr. Kheterpal, et al. says that the hair follicle growth cycle is divided into three phases: Anagen (growing), catagen (resting) and telogen (regeneration) (shedding). In general, 90 percent of the hairs are in the anagen phase, with 5 percent in catagen and 5 percent shedding in the telogen phase of the growth cycle.

However, the proportion of hair follicles in the telogen phase increases, up to 50 percent resulting in massive shedding, as seen in telogen effluvium. There is some genetic tendency and nutrition, particularly iron, biotin and vitamin D, have role. Checking Fe and vitamin D levels may be recommended, as well as taking an iron fortified multivitamin or taking an iron supplement. A biotin supplement could also assist. There are numerous stressors associated with pandemics and quarantines that might exacerbate symptoms.

Alfredo Rossi, Francesca Magri, Alvise Sernicola, Simone Michellini, Gemma Caro, Marta Muscianese, Marco Di Fraia, Camilla Chello, Maria Caterina Fortuna and Teresa Grieco, et al. In a case report assessed 14 cases of recovered COVID-19 infection. Trichoscopy and trichogram to investigate pattern of hair loss related to COVID-19 in the patients were used for acute hair loss after SARS-CoV-2. The pull test, trichogram and trichoscopy were used in the clinical examination.

The average length of hair shedding was five months (range 1-6 months). Trichoscopy revealed TE patterns that were diverse yet usual. Hypothesis was made, different pathogenic processes implicated includes the release of pro-inflammatory cytokines and direct damage to the hair follicle by the virus.

More research on bigger samples is needed, however, to improve our present understanding of this TE disease [24].

Omer Kutlu, Habibullah Aktas, Isil Gogem Imren, Ahmet Metin, et al. reported that the percentage of alopecia was 1.48% after the pandemic while it was 0.97% before the COVID-19 pandemic [25].

Aida Gadzhigoroeva, Daniela Guzman Sanchez, et al. in their study reported to have a positive correlation with the SARS-CoV-2 infection; diffuse alopecia is seen to be an important sequel of COVID-19. A large longitudinal study on 538 COVID-19 survivors and 184 controls was carried out in Wuhan, China, in order to investigate the

prevalence and predictors of COVID-19 clinical sequel. 3-4 months after discharge, alopecia was among the most prevalent complains in convalescent COVID-19 patients, reported more commonly by women. In the control group, almost half of the female participants started experiencing hair loss after being infected by COVID-19 compared to no case. 27% of affected cases experienced alopecia during their hospitalization while 73% first recognized it after being discharged. Due to the timing of symptoms, at least a proportion of the cases with newly onset alopecia in this study are suspected to have premature or exacerbated FPHL [26].

CONCLUSION

COVID-19 and TE ought to have strong correlation as per studies. TE is diffuse, non-scarring hair loss observed in majority of post COVID-19 recovered cases. The hair shedding is observed in 1-3 months in acute condition. TE being self-limiting; the normal hair pattern is regained in 6-9 months. Fever being the prime factor involved for TE. Psychological stress also aggravates the situation which was seen to have a rise during the pandemic. TE is observed more if the length is more, in females, in hypertensive and patient who show significant lung involvement *i.e.* severe patients.

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