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Cross-sectional study to determine the prevalence of telogen effluvium among patients experiencing COVID-19 infection or vaccination in Saudi Arabia and Arabic countries

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Abstract:

Background: Telogen effluvium (TE) after COVID-19 infection or vaccination is a common sequelae in dermatology clinics.

Objective: to study the prevalence of telogen effluvium in COVID-19 patients and its association with COVID vaccine.

Methods: Cross-sectional study via online questionnaire in Saudi Arabia and other Arabic countries.

Results: Prevalence of hair loss among COVID-19 patients is ~85% with 45.9% meeting the criteria of TE. Majority of those with high fever associated with COVID-19 developed TE (87.5%). 100% of hospitalized patients exhibited TE with 58% having diffuse hair loss for less than 6 months (acute TE) and 32% for more than 6 months (chronic TE). 63.2% of our participants had hair loss after COVID vaccination regardless of vaccine type with the majority experiencing it after the first dose (55.8%).

Limitations: The majority of the participants were female. Other factors associated with hair loss were taken into consideration.

Conclusions: COVID-19 infection and its vaccines carry a high risk for development of telogen effluvium.

Keywords: COVID-19, SAR-COV-2 , Telogen effluvium , hair loss, Vaccine, Saudi Arabia, COVID-19 Vaccination, Corona virus, Vaccine reactions, COVID19 vaccine .

Capsule summary:

- Telogen effluvium is a diffuse non-scarring form of hair loss. COVID-19 infection and its vaccines are associated with increased incidence of telogen effluvium globally and in Saudi Arabia and surrounding Arabic countries.
- The tremendous psychological impact can be alleviated by proactive patient education with reassurance, and vaccination should not be delayed due to fear.

Introduction

Hair loss accompanying SARS-CoV-2 (COVID-19) infection as well as its various vaccine strains has been a global epidemic. Telogen effluvium (TE), a form of non-scarring alopecia associated with bodily stress events, has become exponentially more prevalent during the COVID-19 pandemic given the millions of people afflicted with virus^{1,2}. The World Health Organization (WHO) has reported over 175 million confirmed cases, with over 480,000 cases in Saudi Arabia according to the Saudi Ministry of Health.^{3,4} Furthermore, the global response to the COVID-19 pandemic with development of various vaccines has resulted in a reported 2.7 billion vaccine doses globally and 16.5 million doses in Saudi Arabia, which continue to quickly rise in number.^{3,4} The incidence of TE during the pandemic increased by ~400% compared to the pre-pandemic rates.⁵ The prevalence of TE in recovered COVID-19 patients is reported to be approximately 27.9%.⁶

The pathogenic mechanism behind TE has been clearly delineated. There is a triggering event such as a major stress (e.g. infection, surgery, febrile illness, significant dietary alteration, medications, psychological stress, etc.). This stress causes a number of hair follicles to abruptly transition from the anagen growth phase into the telogen resting phase, which lasts an average of 3 months before the hair is shed and then re-enters anagen growth.⁷ The amount of visible hair loss due to this shedding is proportional to the number of hair follicles simultaneously entering telogen phase.^{8,9} It is also hypothesized that the greater the bodily stress the greater the number of anagen hairs will enter telogen.^{8,9}

TE associated with the COVID-19 pandemic is unique as the underlying cause is multi-factorial. Infection with the COVID-19 virus causes pleiotropic manifestations in infected patients including an exaggerated immunological response as well development of microthrombi that could lead to microvascular insufficiency in scalp hair follicles with an already narrowed vascular network.^{10,11} The major psychological stress surrounding the pandemic is another contributor.⁷ TE has also been associated with different COVID-19 vaccines based on clinical practices, and it is hypothesized that the mechanisms leading to hair loss are similar to the virus infection itself.

Here we set out to ascertain the prevalence of TE in patients afflicted with COVID-19 virus or who have received a COVID-19 vaccine in Saudi Arabia. We performed a cross-sectional analysis of a representative subgroup of patients via an online questionnaire. We further assessed associated symptoms that patients experienced along with their hair loss and stratified patients based on what vaccine they received. To our knowledge, this is the first epidemiological study assessing the association between hair loss, particularly TE, and COVID-19 infection and vaccination in the Saudi Arabian population as well as neighboring Arabic countries.

Methods

Study design

An observational cross-sectional study to determine the prevalence and associated symptoms of telogen effluvium (TE) among COVID-19 patients and recipients of COVID-19 vaccines in Saudi Arabia.

Study setting

The study was conducted in the Kingdom of Saudi Arabia via an online questionnaire.

Target population

Male and female residents of Saudi Arabia and neighboring Arabic countries who experienced hair loss during the COVID-19.

Sample size

The sample size of 310 participants was determined by using Sample Size Calculation as noted below:

$$n = \frac{Z^2 \times p \times (1 - p)}{d^2}$$
$$n = \frac{1.96^2 \times 0.28 \times (1 - 0.28)}{0.05^2}$$
$$n = 310$$

Duration of the study

The study duration was from June 2021 to November 2021.

Sampling technique

Sampling was performed through a close-ended online questionnaire.

Data collection

Data was collected through a close-ended online questionnaire using Google Forms, which was distributed through various social media platforms. There were 38 questions, which included questions about demographic data, COVID-19 status, current medical conditions causing hair loss, prevalence of telogen effluvium in COVID-19 patients, and the association between COVID-19 vaccine and TE.

Data analysis

Statistical analysis was performed using SPSS 25 (IBM, Chicago, Illinois, United states).

Ethical considerations

The participants were aware of the study and were informed that participation is voluntary. Confidentiality of the participants was respected. Before conducting the study, ethical approval was obtained from the University Ethics Committee at Majmaah university (MUREC)(HA-01-R-088) with ethics number: MUREC-Nov.11/com-2021/11-1 .

Inclusion and exclusion criteria

Data was collected from people older than 10 years of age and from different regions of Saudi Arabia and other Arabic countries. Participants with a concurrent hair loss and those with underlying medical conditions causing hair loss included.

Results

Table 1 lists the demographic data of the study participants. A total of 2,294 questionnaires were obtained with 2,193 females and 101 males completing the study.

Table 1. Demographic data

Demographic data:		<i>Frequency</i>	<i>Percent</i>	<i>p-value</i>	
Age	10-20 years old	178	7.8	0.00**	
	20-30 years old	1129	49.2		
	30-40 years old	732	31.9		
	40-50 years old	206	9.0		
	50-60 years old	44	1.9		
	60-70 years old	5	0.2		
Gender	Male	101	4.4	0.00**	
	Female	2193	95.6		
Marital status	Single	1294	56.4	0.00**	
	Married	876	38.2		
	Divorced	111	4.8		
	Widowed	13	0.6		
Nationality	Saudi	1977	86.2	0.00**	
	Non-Saudi	317	13.8		
	If non-Saudi, Nationality	Kuwaiti	41	1.8	0.00**
		Emirati	18	0.8	
		Qatari	10	0.4	
		Bahraini	20	0.9	
		Egyptian	11	0.5	
		Syrian	25	1.1	
		Lebanese	4	0.2	
		Jordanian	9	0.4	
Other	179	7.8			
Country that you live in (country of residence)	Saudi Arabia	2069	90.2	0.00**	
	Kuwait	51	2.2		
	Emirates	26	1.1		
	Qatar	13	0.6		
	Bahrain	19	0.8		
	Egypt	4	0.2		
	Other	112	4.9		
Total		2294	100.0		

COVID-19 status and TE

947 (41.3%) participants reported having COVID-19 infection of which 85.8% were diagnostically confirmed by PCR testing. A diagnosis of COVID-19 infection was rendered in the remaining participants via self-diagnosis based on signs and symptoms (9.6%), physician clinical judgement but without confirmatory testing (3.3%) or serum antibody test (1.4%). 807 of the 947 (85.1%) participants with COVID-19 infection experienced hair loss ($p < 0.05$; Figure 1, Table 2).

Figure 1. Shows the percentage of COVID-19 associated hair loss



In terms of symptoms, 23.7% of participants experienced itchy scalp, 22.2% dandruff, 13.6% painful/sensitive scalp, 4.7% burning scalp sensation, and 2.5% had other symptoms (Figure 2).

The majority (79.6%) exhibited symptoms (dyspnea, cough, malaise, and sore throat) ($p < 0.05$) with 64.1% having a high fever. 5.5% were hospitalized due to COVID-19, and 1.1% were admitted to the intensive care unit (ICU).

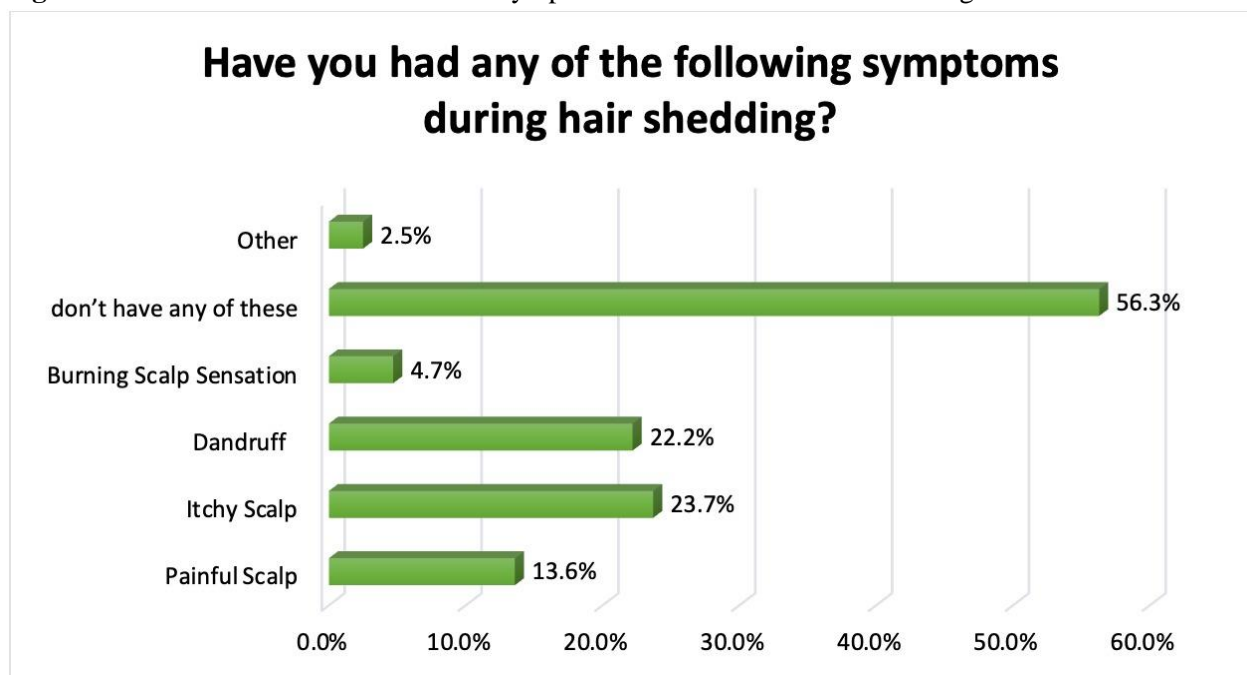
Table 2. COVID-19 and TE

		<i>Frequency</i>	<i>Percent</i>	<i>p-value</i>	
Have you experienced hair loss after COVID-19?	Yes	807	85.1	0.00**	
	No	141	14.9		
Total		948	100.0		
If yes,	When did you notice it after COVID-19 diagnosis?	after few days	185	22.9	0.00**
		less than 1 month	227	28.1	
		1-2 months	187	23.2	
		2-3 months	95	11.8	
		3-4 months	38	4.7	

	4-5 months	18	2.2	
	6 months or more	32	4.0	
	I do not remember	25	3.1	
For how long did your hair continue to fall out?	less than 1 week	6	0.7	0.00**
	1 month	61	7.6	
	1-2 months	157	19.5	
	2-4 months	148	18.3	
	4-6 months	110	13.6	
	more than 6 months	258	32.0	
	I do not remember	67	8.3	
Did your hair recover and stop falling out after COVID-19?	Yes	127	15.7	0.00**
	No	680	84.3	
Have you been seeking medical advice for this hair loss?	Yes	185	22.9	0.00**
	No	622	77.1	
Total		807	100.0	

TE: Telogen Effluvium

Figure 2. Demonstrate the most common symptoms associated with hair shedding.



Medical conditions, stressful events and medication exposures causing hair loss other than COVID-19

With respect to medical conditions causing hair loss, 17.2% of the participants reported anemia, 8.8% reported polycystic ovarian syndrome, and 7% reported a thyroid disorder. The remaining 71.1% did not report any of these diseases.

When asked if they had been diagnosed with a hair disorder, 20.2% answered that they had been diagnosed with androgenetic alopecia, 5.2% with telogen effluvium, 3.8% with trichotillomania, 1.3% with alopecia areata, and 0.2% with lichen planopilaris. 72.1% had not been diagnosed with any hair disorder.

Regarding exposure to stressful events in the past 4 months, 10.8% had been exposed to severely stressful emotional events. These include marked weight loss (4.3%), surgery (3.4%), childbirth (3.1%), severe infection other than COVID-19 (1.3%), and 1.4% experiencing severe burns, accidents, or a terminated pregnancy. Contrastingly, 79.6% had not experienced any of these stressors in the past 4 months.

Next, participants were asked about long-term medications. Of the sampled participants, 8.5% received hormonal therapy (oral contraceptive), 7.5% acne medications (retinoids), 2.9% anti-depressants, 2% anti-DHT medications, and 4.6% hormonal therapy (testosterone), cholesterol medications (statins), hypertension medications (beta-blockers or ACE inhibitors), chemotherapy medications, or anticoagulants (heparin). The remaining 79.1% of respondents did not use any of these.

COVID-19 vaccination and TE

Next, we explored the association between COVID-19 vaccination and TE (Table 3). 2,075 (90.5%) of participants received a COVID-19 vaccine. Among those who received the vaccine, 80.8% received the Pfizer-BioNTech, 14.5% received the Oxford/AstraZeneca, 0.4% received Moderna, and 4.3% received another type of vaccine. In addition, 64.4% of participants received two doses of vaccine, while 35.6% received only one dose.

1,311 (63.2%) of participants who received a COVID-19 vaccine experienced hair loss, which is . Among those who experienced hair loss after COVID-19 vaccination, 55.8% experienced it after the first dose whereas 44.2% after the second dose. 91.7% of participants with post-vaccination hair loss reported no recovery in hair growth or cessation of hair shedding. In addition, 85.6% of participants did not seek medical advice for this hair loss.

Table 3. COVID-19 vaccines and TE

		<i>Frequency</i>	<i>Percent</i>	<i>p-value</i>
Did you receive a COVID-19 vaccine?	Yes	2075	90.5	0.00**
	No	219	9.5	
Total		2294	100.0	
If yes, Which brand of vaccine?	Oxford/AstraZeneca	300	14.5	0.00**
	Moderna	9	0.4	
	Pfizer-BioNTech	1677	80.8	

		Johnson & Johnson	0	0.0	
		Other	89	4.3	
How many doses?		1	738	35.6	0.00**
		2	1337	64.4	
Did you have high fever after the COVID-19 vaccine?		Yes	538	25.9	0.00**
		No	1537	74.1	
Have you had hair loss (notice more hair falling out in your hand or in the drain during showering or more hair on pillow or comb) after COVID-19 vaccination?		Yes	1311	63.2	0.00**
		No	764	36.8	
Total			2075	100.0	
If yes,	After which dose?	1	731	55.8	0.00**
		2	580	44.2	
	When did you notice it after COVID-19 vaccination?	After few days	594	45.3	0.00**
		Less than 1 month	420	32.0	
		1-2 months	181	13.8	
		2-3 months	45	3.4	
		3-4 months	19	1.4	
		After 4-5 months.	9	0.7	
		After 6 months or more	10	0.8	
	I do not remember	33	2.5		
	Did your hair recover and stop falling out after COVID-19 vaccination?	Yes	109	8.3	0.00**
		No	1202	91.7	
	Have you been seeking medical advice for this hair loss?	Yes	189	14.4	0.00**
		No	1122	85.6	
	Total			1311	100.0

TE: Telogen Effluvium

Significant associations between TE after COVID-19 vaccination and dose number exist ($p < 0.05$). 731 people (55.7%) reported TE after the first dose, while 581 (45.3%) reported TE after the second dose. Increased risk of TE is also noted across vaccine types with similar rates (67, 66, and 69% for Oxford/AstraZeneca, Moderna and Pfizer-BioNTech vaccines, respectively). Those who received mixed-type vaccines also demonstrated an increased risk of TE (38 participants, 76%). However, there is a lower risk of hair loss in association with the Chinese Sinopharm vaccine (47%).

Discussion

In this observational cross-sectional study, we discovered that the majority of patients afflicted with SARS-Cov-2 (COVID-19) in Saudi Arabia and neighboring Arabic countries (85% of participants) experienced hair loss with 45.9% having true TE (diffuse hair loss approximately 1-2 months after having COVID-19 infection). The prevalence of TE in our study was higher than that of other international studies. Two studies reported the prevalence of TE to be 27.9% and 27% in patients infected with COVID-19.^{6,12} However, this could be due to the overall increased prevalence of COVID-19 patients since the time of those studies.¹³ Nonetheless, a significant increase in TE rates among COVID-19 patients has been noted by all studies.

COVID-19 symptom severity was also associated with increased risk of TE, such as high fever and hospitalization. This is in accordance with the concept of TE arising due to a severe stress. Our result aligns with that of Thuangtong et al. who found rate of hair shedding to be significantly higher in patients with moderate, severe, and critical COVID-19 status than in those with asymptomatic and mild infections.¹⁴

Hair loss associated with TE usually persists for up to 6 months after the triggering factor is removed.² If it lasts longer than 6 months, it is called chronic TE.¹⁵ In this study, we found that approximately 58% of patients had diffuse hair loss for <6 months (acute TE) after COVID-19 infection and 32% had hair loss for >6 months (chronic TE).

Survey participants who received one or more vaccines against COVID-19 also had a statistically significant increase in TE. Cutaneous reactions after COVID-19 vaccination have been widely reported.¹⁶ Local injection site reactions, urticarial eruptions, and morbilliform eruptions have been reported, but delayed, large local reactions are the most common cutaneous reactions.¹⁷ Hair loss associated with the vaccine has not been widely discussed in the literature. A single study in Poland reported hair loss after COVID-19 vaccination as a part of post-vaccination reactions: only 2.2% of study participants had hair loss after the vaccine, of which 46.4% and 53.6% having hair loss after the first and second doses, respectively.¹⁸ In the present study, we found a much higher incidence; 63.2% of our participants had hair loss after the COVID-19 vaccine, with the majority after the first dose (55.8%) and 44.2% after the second dose. Furthermore, all vaccine types carried a similar high risk of TE as a side effect except one (Sinopharm, China). Notably, the highest risk was seen when mixing vaccines. This latter finding may be explained by different mechanisms synergistically leading to stimulation of the immune system.

TE in the COVID-19 pandemic period also adds further stress and may contribute to ongoing shedding and lack of new hair growth. Therapeutic intervention is therefore critical to help break the cycle. Interestingly, we found that only 22.9% of patients sought medical advice, similar to the rate of 18.9% reported by Turkmen et al.⁶ It is unclear why there is a gap in seeking medical advice for these patients, and future studies are required to understand why (i.e. possible cultural barriers to seeking care). Nonetheless, the therapeutic approach in TE generally involves identifying and eliminating triggering factors in combination with medical intervention. In the case of post-COVID-19 infection or post-vaccination, the triggering factor has been identified,

but other causes should be considered.^{2,19} Acute telogen effluvium usually resolves spontaneously when the triggering factor is removed. Chronic TE usually disappears 6–12 months after the triggering factor is removed. Corticosteroid creams, topical minoxidil, or oral minoxidil (in the case of chronic TE) can be administered after the cause has been determined.²⁰ A major limitation of this study is the significantly disproportionate amount of female to male participants who took part in the questionnaire. Future studies should aim to balance this.

Conclusion: COVID-19 infection is associated with the significant rise in the incidence of TE in Saudi Arabia and neighboring Arabic countries. Increased risk of TE is also associated with COVID-19 severity such as febrile illness and hospitalization. The majority of TE cases are of the acute type, but chronic TE is also evident. In addition, COVID-19 vaccination is associated with the of TE.

Patient Consent on File: Consent for the publication of recognizable patient photographs or other identifiable material was obtained by the authors and included at the time of article submission to the journal stating that all patients gave consent with the understanding that this information may be publicly available.

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None

Statement of ethics:

The participants were aware of the study and were informed that participation is voluntary. Confidentiality of the participants was respected. Before conducting the study, ethical approval was obtained from the University Ethics Committee at Majmaah university (MUREC)(HA-01-R-088) with ethics number: MUREC-Nov.11/com-2021/11-1.

Conflicts of interest:

The authors declared no potential conflicts of interest.

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Author contributions: Y.A. contributed in writing the body of manuscript, data analysis and interpretation . W.A. contributed in the study design, data analysis and interpretation, and critically revised the manuscript. N.T.I. contributed in data interpretation and critically revised the the manuscript.

Data availability statement:

The data that support findings of this study are available in request on these emails : 371102279@s.mu.edu.sa , w.alsalhi@mu.edu.sa . Also for obtaining all generated and analyzed data of this research study, you can contact us on the same emails .

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