Review Article

Hair loss – A growing problem among medical students

Arpita Meher[1], Alina Safi[1], Nadia Rahman Momo[1], Atroba Zaheer[1], Naga Harika Korrapati[1], Nupura Ajesh[1], Khyathi Nanduri[1]

[1]Department of Medicine, Tbilisi State Medical University, Tbilisi, Georgia.

*Corresponding author:
Arpita Meher,
Department of Medicine,
Tbilisi State Medical University,
Tbilisi, Georgia

meher.arpita65@gmail.com

ABSTRACT

Hair loss is a common problem that can affect people of different ages, genders, and professions. Medical students, in particular, may experience a higher rate of hair loss due to the rigorous academic curriculum, long hours of studying, high levels of stress, lack of sleep, and poor nutrition. This article discusses the various causes and types of hair loss, including genetic factors, stress, nutrition deficiencies, hormonal imbalances, and the use of chemicals. It also mentions the impact of COVID-19 on hair loss and the potential role of medications in treating hair loss. Overall, it emphasizes the importance of understanding and addressing the underlying causes of hair loss in medical students to promote their well-being and reduce the risk of hair loss.

Keywords: Medical students, Hair loss, Alopecia, Telogen effluvium, COVID-19

INTRODUCTION

Hair loss is a common problem that affects people of different ages, genders, and professions. It can result from various factors such as genetics, hormonal imbalances, medical conditions, medication side effects, stress, poor nutrition, and environmental factors. Hair loss can lead to a reduction in self-esteem, confidence, and overall quality of life.[1]

Medical students have a greater rate of hair loss than the general population and it is critical to understand the underlying reasons for this occurrence. For medical students, in particular, hair loss can be a significant concern for several reasons, including the rigorous academic curriculum that demands long hours of studying and clinical rotations, leading to high-stress levels, lack of sleep, and poor nutrition.[2] This article explores the various causes and types of hair loss, including androgenetic alopecia (AGA), alopecia areata, and telogen effluvium, as well as lifestyle modifications and medical interventions that can help reduce the risk of hair loss among medical students.[3] Creating a supportive environment that promotes self-care practices and addresses stressors in the academic environment can also help medical students to maintain good mental and physical health and reduce the risk of hair loss. The study aimed to classify the reasons for hair loss in medical students and to gather information from previously published studies that dealt with the subject. Further, the aim was to investigate the causes of hair loss in medical students, collect data from published articles on hair loss in medical students, and classify the causes of hair loss in medical students.

MATERIALS AND METHODS

The literature analysis aimed to find out the reasons for hair loss faced by medical students. Google Scholar and PubMed were used to conduct the literature review. To gather data, keywords such as

"Young population, medical students, hair loss, hair fall, and COVID-19" were used and the past 5 years' worth of data was collected during the literature review. The literature review was completed from 2022 to 2023 by collecting data from 16 articles. Using the data collected, the information revealed the different variations of hair loss due to numerous factors.

RESULTS

According to the research, stress has a significant impact on the hair loss reported by medical students. While a variety of factors can contribute to hair loss, stress has emerged as a primary culprit. Other variables that contributed to hair loss were poor diet, hormone imbalances, and the use of chemicals in hair treatment, among others. Stress-induced hair loss has been found to appear in disorders such as alopecia areata or telogen effluvium. The study also offered insight into COVID-19's effect on hair loss and the link between hair color usage and hair damage. Furthermore, the research examined several therapeutic options for treating hair loss in both men and women, including prescription and topical therapy [Table 1].

MAIN CAUSES OF HAIR FALL

Genetics

Today's Millennials and Generation Z are known to experience more stress than any generation before them. A fraction of individuals belonging to these generations is current international medical students, where medicine is known to be one of the most stressful fields to study. Hair loss may be aggressive when high stress is combined with a genetic predisposition, dietary inadequacies, internal disorders, and poor hair care habits.[1,4]

Stress

Recent studies have linked stress to various illnesses. Our study found that medical students experienced examination-related and dietary stress, which may impact their hair texture and condition. Besides stress, other factors such as humidity, wind, air pollution, and strong sunlight can contribute to alopecia.[2] High-stress levels in men and women are associated with hair loss, regardless of age.[5]

Academic stress was a major source of stress at a public sector medical institution. According to an Arabic survey, 1st-year students (78.7%) were the most stressed, followed by 2nd-year students (70.8%), 3rd-year students (68%), 4th-year students (43.2%), and final-year students (48.3%).[5]

All research participants reported hair loss as a result of high levels of stress, notably medical students. Emotional stress such as an examination or work-related stress, and medical stress from surgery or accidents can lead to hair loss. There is a positive correlation between stress and cortisol levels in the hair. Examination stress increases T helper type 1cells, which inhibits hair growth and causes epithelial cell apoptosis. Stress-induced hair loss is an environmental factor, categorized as alopecia areata or telogen effluvium.[6]

Nutrition

[Table 2]. Hair Loss Associated With Nutritional Deficiency.[7]

Hormones

[Table 3]. Effects of Hormone on Hair Follicle.[2]

AGE GROUP AND GENDER BEING AFFECTED

Various epidemiological patterns are depending on the type and cause of alopecia. With no racial or sexual preference, alopecia areata has a prevalence of 0.2% and can affect people of any age. A common disorder, androgenic alopecia, affects 15% of women and 50% of men, particularly postmenopausal women. Women typically experience telogen effluvium more than men. Tinea capitis is more prevalent in children under the age of five and in people with dark skin who do not have any sexual preferences.[8]

TYPES OF HAIR LOSS

Hair loss can affect both genders and has different types and causes. Men experience thinning at the temples, frontal and vertex scalp, or complete hair loss with hair remaining at the back and sides, while women experience diffuse hair thinning at the vertex with preserved frontal hairline and lateral scalp thinning [Figure 1].[3]

There are two primary types of hair loss disorders: Non-scarring alopecia and scarring alopecia. Non-scarring alopecia refers to hair loss conditions where the hair follicle is preserved, but the hair cycle, size, or breakage has changed. Scarring alopecia refers to hair loss where hair follicles are destroyed due to inflammation or malignancy. Different types of scarring alopecia include lichen planopilaris, frontal fibrosing alopecia, chronic cutaneous lupus erythematosus, central centrifugal cicatricial alopecia, and folliculitis decalvans. Each type has distinct patterns of hair loss and symptoms.[3]

One of the most significant hair issues affecting both men and women is pattern hair loss (PHL). Age-dependent forms of scalp hair loss in women were well-known long before this condition was given a clinical description. Female-PHL, also known as AGA, is a common hair issue that causes a decrease in hair density over the frontal scalp and crown in women.[9] Male-PHL is a common problem among most men which can begin as early as puberty and worsen with age.[10]

Anagen, catagen, telogen, and exogen are the four stages of the development of hair [Figure 2].[11]

Table 1: Reference-wise summary.

S. No.	Authors/ year	Study type	Findings	Links
1.	Korrapati and Bhowmik 2021	Survey based research	A survey of foreign medical students found that 81.7% experienced hair loss, with stress and nutritional deficiencies identified as contributing factors. Moving to Georgia and the COVID-19 pandemic were also linked to increased hair loss. However, despite awareness, most students did not seek treatment.	https://ijpsat.org/index.php/ ijpsat/article/view/2810
2.	Edriss *et al.* 2021	Cross-sectional study	A study examined the relationship between stress and hair loss in medical students. Significant associations were found between stress and hair loss, but no significant differences were observed based on gender or medical school class level. Further analysis is needed to explore the causes of stress-induced hair loss and demographic factors.	https://www.mdpi. com/2673-9976/9/1/7
3.	Kim *et al.*, 2022	Analytical research	Hair loss can be distressing and has various causes. Scarring alopecia requires a dermatologist's evaluation, while non-scarring alopecia can be diagnosed and treated by family physicians. Different types of hair loss have specific characteristics and treatment approaches	https://www.mdpi. com/2313-433X/8/10/283
4.	Malkani *et al.*, 2020	Cross-sectional study	A cross-sectional study found that women with hairstyling treatments in the past 6 months were more likely to have microscopic abnormalities, even though there was no difference in hair evaluation parameters. Specific guidelines for hairstyling on Indian hair are needed.	https://pubmed.ncbi.nlm.nih. gov/32832441/
5.	Fatima *et al.*, 2018	Cross-sectional study	A study evaluated hair loss among medical students and its relationship to stress. Out of 300 participants, 85.67% experienced hair loss, and there was a significant association between moderate-to-severe stress and hair loss. Hair fall was found to be common among Allama Iqbal Medical College students.	http://jumdc.com/index.php/ jumdc/article/view/54
6.	Oyedepo *et al.*, 2020	Cross-sectional study	Age-specific surveys of skin diseases are typically required to assess the real burden of skin disease within a particular population and aid in directing healthcare staff education and delivery toward the most common illnesses in resource-constrained settings.	https://pubmed.ncbi.nlm.nih. gov/32774612/
7.	Almohann *et al.*, 2018	Review	When evaluating hair loss patients, screening for nutrient deficiency risk factors is important. Correcting deficiencies is necessary, but research on nutrient supplementation without deficiencies is insufficient, and some supplements may have risks.	https://link.springer. com/article/10.1007/ s13555-018-0278-6
8.	Al Aboud and Zito, 2023	Review	This activity aims to educate healthcare professionals on the etiology, clinical presentation, and evidence-based treatment options for various types of alopecia.	https://www.ncbi.nlm.nih.gov/ books/NBK538178/
9.	Bains *et al.*	Review	Female PHL is a common condition characterized by hair loss over the crown and frontal scalp. Its pathophysiology involves both androgen-dependent and independent mechanisms. Treatment involves medical and surgical options, with early initiation and long-term management being crucial for optimal outcomes.	https://pubmed.ncbi.nlm.nih. gov/35642228/
10.	Liu *et al.* 2022	Comparative study	Male PHL requires an ideal classification system to accurately diagnose and monitor the condition. This review compares existing classifications in terms of detail, practicality, and reproducibility, aiming for improved patient treatment and monitoring.	https://pubmed.ncbi.nlm.nih. gov/35862273/

Table 1: (*Continued*).

S. No.	Authors/ year	Study type	Findings	Links
11.	Xiong *et al.* 2023	Analytical study	Alopecia areata is an autoimmune disorder causing non-scarring hair loss. Genetic studies have identified susceptibility loci. Diagnosis is clinical, and new treatments show promise for future management.	https://pubmed.ncbi.nlm.nih. gov/37333624/
12.	Sajid *et al.* 2022	Cross-sectional study	A study aimed to assess hair shedding frequency, knowledge, misconceptions, and hair care practices among adults. Approximately half of the participants reported daily hair fall, with significant correlations found for certain risk factors. A lack of knowledge about hair fall causes was observed, but overall hair care practices were satisfactory.	https://www.jpad.com.pk/ index.php/jpad/article/ view/1752
13.	Galchenko *et al.* 2021	Comparative study	This study compared the hair composition of toxic elements in people from different regions of the world. Overall, the concentrations of toxic elements fell within the normal range, but some cases of exceeding recommended levels were identified. Positive correlations between certain elements were found. The study emphasizes the need for further large-scale environmental research due to the deteriorating environmental situation globally.	https://link.springer. com/article/10.1007/ s11356-021-16253-8
14.	Saeed *et al.* 2020	Case reports	People experienced severe hair loss 2–3 months after contracting COVID-19. This is a known side effect of the virus, and it can be a sign of psychological distress. The COVID-19 pandemic has had a significant psychological impact on society as a whole, and the long-term aftereffects of the disease are further compounding this suffering.	://www.jpad.com.pk/index. php/jpad/article/view/1636
15.	Sattur and Sattur 2021	Review	A hair restoration clinic has seen a significant increase in patients with hair loss in the past 18 months. This is likely due to COVID-19 infection, which can cause hair loss through a variety of mechanisms. The virus may directly affect hair follicles, or it may trigger an immune response that leads to hair loss.	https://www.thieme-connect. com/products/ejournals/ html/10.1055/s-0041-1740289
16.	Coleman 2020	Research article	This essay discusses four common hair loss conditions that affect both men and women. It includes information on how to treat and manage these conditions, as well as the latest research on androgenetic alopecia, telogen effluvium, alopecia areata, and scarring alopecia. A variety of diagnostic tools and tests are available to ensure that patients receive the best possible care.	https://www.ingentaconnect. com/content/wk/ psn/2020/00000040/00000004/ art00019

PHL: Pattern hair loss

Stress, according to a comparative study of stress among medical, engineering, and nursing students, can also induce alopecia areata (partial loss of body hair) or alopecia universalis. Stressors can cause hair loss directly or indirectly by encouraging inappropriate hair-plucking behavior.[6]

Three hundred and eighty-five participants, mostly women (81.2%), were surveyed about their hair care practices and awareness of hair loss risk factors. Half (53.2%) reported daily hair loss, and risk factors such as dandruff, unbalanced diet, insomnia, and hereditary factors were identified. Physically active males had less hair loss, but there was no such correlation among females. A lack of knowledge and understanding about hair loss risk factors was observed. Hair care practices were found satisfactory for both genders.[12]

EPIDEMIOLOGY ACROSS THE GLOBE

The increase in industrial and energy-related activities has led to a rise in environmental pollution, resulting in the accumulation of toxic elements in the biosphere. This study aimed to compare the concentration of toxic elements in hair samples of individuals from different regions across the world. The study analyzed 198 hair samples of 1st-year students at the People's Friendship University of Russia, originating from South and East Asia, Latin America, Arab countries, Central Asia and Afghanistan,

Table 2: Hair loss associated with nutritional deficiency.[7]

Nutrient	Hair loss association
Iron	Chronic diffuse telogen hair loss along with anemia
Zinc	In research, lower serum zinc levels were linked to both the male and female patterns of hair loss, alopecia areata, and telogen effluvium
Niacin (Vitamin B3)	Pellagra causes diffuse hair loss due to a severe deficit.
Fatty acids	Hair loss on the scalp and brows
Selenium	Hair growth is sparse
Vitamin D	In hair loss research, serum Vitamin D2 levels were shown to be lower
Vitamin A and E	There is no recognized relationship
Biotin	Can cause baldness, skin rashes, conjunctivitis, and candidiasis
Amino acids and proteins	Occurs as a result of protein deficiency.

Table 3: Effects of hormone on hair follicle.[2]

Hormones	Effect on hair follicles
Estrogen and progesterone	Menopause might result in hair loss and finer texture
Testosterone	Increases during menopause might have an impact on hair follicles
Vitamin D	Essential for hair follicle differentiation; lack may result in alopecia
Calcitriol	It has the potential to be utilized to treat chemotherapy-induced alopecia.

South and Central Africa, Iran and Azerbaijan, and Russia, Ukraine, and Moldova. The study used inductively coupled plasma mass spectrometry to measure the concentration of seven toxic elements, including aluminum, arsenic (As), beryllium, cadmium, mercury, lead, and tin (Sn). The median concentration of these elements in the general group fell within the normal range. Except for Latin America, students from Russia, Moldova, and Ukraine had much greater Sn levels in their hair than students from other locations. Although most of the toxic elements fell within the normal range, some subjects exceeded the recommended levels for As. Overall, this study provides valuable insights into the distribution of toxic elements across different regions worldwide.[13]

ADVERSE EFFECTS OF STYLING

Hair care and styling have grown in popularity in recent years, particularly among teenagers. It has been observed that modern styling methods and the use of various hair care products have resulted in hair loss and damage. The process of chipping the hair cuticle is a primary cause of hair damage.[4]

Girls have unique hair care and style habits. These habits have been linked to an increased incidence of scalp and hair dermatoses. Straighteners and dyes have been linked to allergic or irritating dermatitis, chemical burns, scarring alopecia, and increased hair breakage.[4]

COVID-19 AND HAIRFALL

The mechanism by which COVID-19 causes hair loss is still not fully understood, but it is believed that the physiological response of follicles to the stress of the infection may contribute to the effluvium that often develops 3–4 months after a fever-producing illness. The cytokines generated during the illness or fever cause the follicles to enter catagen and telogen too soon, leading to shedding. Hair loss is the most recent post COVID-19 symptom to emerge. Although it might be exceedingly distressing, patients can be reassured that they will recover due to the temporary nature of the sickness. The majority of COVID-19 patients have telogen effluvium, which is a non-scarring, transient hair loss caused by an aberrant change in the follicular cycle.[14] It has also been linked to the fast progression of alopecia areata, exacerbating pre-existing conditions in some patients. Stress brought on by isolation during the pandemic has also been connected to the development of alopecia areata.[15]

MEDICATION

There are currently two medications authorized for the treatment of hair loss in men: Oral finasteride and topical minoxidil. Both medications affect the hair-growth cycle and lengthen existing hair, enhancing scalp coverage, and preventing additional hair loss in the vertex and frontal areas. However, neither medication fully regrows hair nor response to treatment is same among individuals. The treatment duration is typically 6–12 months. Finasteride reduces the conversion of testosterone to dihydrotestosterone by acting as a competitive inhibitor of Type 2 5'-reductase, and a daily dosage of 1 mg is safe and well tolerated. Minoxidil encourages hair growth by lengthening the anagen phase and enlarging underdeveloped and miniature follicles. The majority of side effects from topical minoxidil are dermatological, including scalp irritation and hypertrichosis. Anthralin possesses an immunomodulation and anti-Langerhans' non-specific cell action. Since it is safe, it is usually chosen for usage in both children and adults with severe alopecia areata, including those who have lost all of their scalp hair. While estrogen has been used in women with AGA, topical minoxidil appears to be more effective in improving scalp coverage and slowing hair loss. Spironolactone has not been shown to effectively treat women with AGA. One of the more successful therapies for people with persistent alopecia areata that affects more than 50% of the scalp is topical immunotherapy (contact sensitization). A strong contact allergen is applied to the patient's scalp to sensitize them, and successive weekly
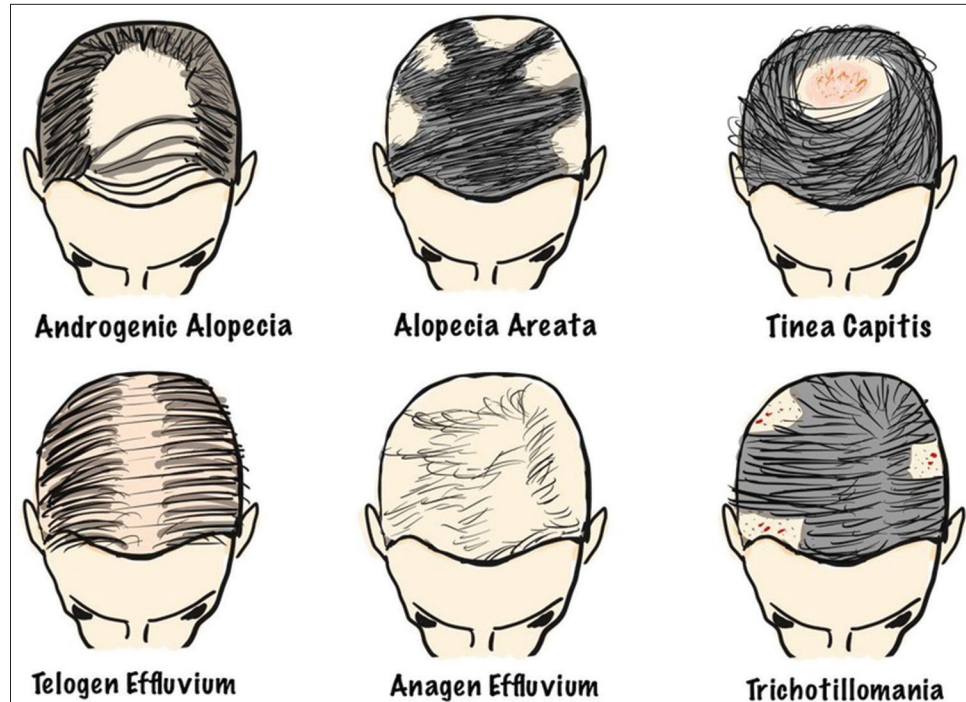
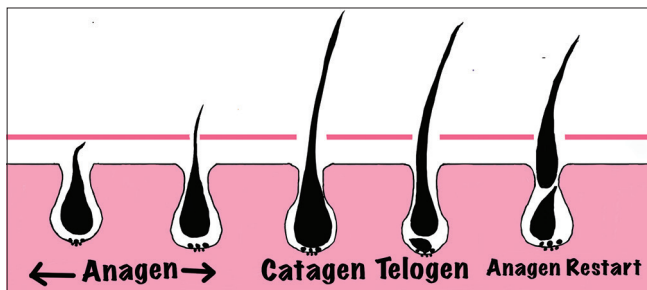**Figure 1:** Types of hair loss.

Figure 2: Phases of hair growth.

administrations of the same substance cause allergic contact dermatitis. Itching and cervical lymphadenopathy are two side effects of topical immunotherapy that are always present.[16]

CONCLUSION

The study looked at several factors that lead to hair loss, such as genetic vulnerability, dietary deficiencies, internal illnesses, incorrect hair care practices, food and examination-related stress, and environmental impacts such as the COVID-19 epidemic. Hair loss was shown to be widespread among international clinical college students. Hair loss has also been linked to stress, particularly in women. Furthermore, hazardous chemicals were discovered to accumulate in people from various places as a result of their hair makeup. The statistics obtained reveal that medical students have shown a greater degree of hair loss that is related to stress along with other factors compared to the general population.

Various types of hair loss have been examined. Genetic mutations, contemporary styling practices, and other factors have all contributed to hair loss and damage. The study underlines the multifactorial nature of hair loss and the significance of a holistic approach to hair care, which includes treating the underlying cause of hair loss and employing appropriate hair care products. To address hair loss successfully, it is critical to understand the various types of hair loss and the particular treatment techniques for each. To minimize hair loss, it is critical to develop creative stress management and resilient measures for medical students.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Korrapati NH, Bhowmik P. Hair loss in foreign medical students and alter its intensity during the COVID-19 pandemic in Georgia. Int J Prog Sci Technol 2021;25:264-73. Available from: https://ijpsat.org/index.php/ijpsat/article/view/2810 [Last accessed on 2023 Jul 04].

2. Edriss M, Alfanharawi H, Musa A, Jaffar S, Potts G, Aranha A. Demographic associations of stress-induced hair loss assessed in medical students. Biol Life Sci Forum 2021;9:7. Available from: https://www.mdpi.com/2673-9976/9/1/7 [Last accessed on 2023 Jul 04].

3. Kim JH, Kwon S, Fu J, Park JH. Hair follicle classification and hair loss severity estimation using mask R-CNN. J Imaging 2022;8:283. Available from: https://www.mdpi.com/2313-433X/8/10/283 [Last accessed on 2023 Jul 12].

4. Malkani RH, Shirolikar SM, Karmakar S, Setia MS. Hair styling procedures and hair morphology: A clinico-microscopic comparison study. Indian Dermatol Online J 2020;11:551-8.

5. Fatima A, Ali MD, Safdar M, et al. Stress related hairloss in medical students. J Univ Med Dent Coll 2018;9:68-3.

6. Oyedepo JT, Katibi OS, Adedoyin OT. Cutaneous disorders of adolescence among Nigerian secondary school students. Pan Afr Med J 2020;36:36.

7. Almohanna HM, Ahmed AA, Tsatalis JP, Tosti A. The role of vitamins and minerals in hair loss: A review. Dermatol Ther (Heidelb) 2018;9:51-70. Available from: https://link.springer.com/article/10.1007/s13555-018-0278-6?fbclid=iwar12p0kj_vyhqhz-gwv4araykekn8czblsfz7pir-h6lvfb14h-k5qeyqzg&swcfpc=1 [Last accessed on 2023 Jul 12].

8. Al Aboud AM, Zito PM. Alopecia. In: Statpearls. Treasure Island, FL: StatPearls Publishing. NCBI Bookshelf National Center. Available from: https://www.ncbi.nlm.nih.gov/books/nbk538178 [Last accessed on 2023 Jul 04].

9. Bains P, Kaur S, Kaur K. Comparison of dermoscopic findings in female androgenetic alopecia and telogen effluvium and female controls in a tertiary care center. J Clin Aesthet Dermatol 2022;15:29-34.

10. Liu Q, Tang Y, Huang Y, Wang J, Yang K, Zhang Y, *et al*. Insights into male androgenetic alopecia using comparative transcriptome profiling: Hypoxia-inducible factor-1 and Wnt/β-catenin signalling pathways. Br J Dermatol 2022;187:936-47.

11. Xiong J, Chen G, Liu Z, Wu X, Xu S, Xiong J, *et al*. Construction of regulatory network for alopecia areata progression and identification of immune monitoring genes based on multiple machine-learning algorithms. Precis Clin Med 2023;6:pbad009.

12. Sajid U, Jaffar N, Khan MA, Abbas K, Ghafoor R, Khan A, *et al*. Frequency of hair fall, its awareness and hair care practices among adult population. J Pak Assoc Dermatol 2022;32:388-95. Available from: https://www.jpad.com.pk/index.php/jpad/article/view/1752 [Last accessed on 2023 Jul 04].

13. Galchenko AV, Sidorova EI, Sherstneva AA, Skalny AA, Lobanova JN. Comparison of concentrations of toxic elements in the hair of first-year students of RUDN University from different regions of the world: A cross-sectional study. Environ Sci Pollut Res Int 2022;29:8341-52. Available from: https://link.springer.com/article/10.1007/s11356-021-16253-8 [Last accessed on 2023 Jul 04].

14. Saeed W, Hussain I, Altaf F. Telogen effluvium: Long term Covid-19 symptom. J Pak Assoc Dermatol 2020;30:695-8. Available from: https://www.jpad.com.pk/index.php/jpad/article/view/1636 [Last accessed on 2023 Jul 04].

15. Sattur SS, Sattur IS. Covid-19 infection: Impact on hair. Indian J Plast Surg 2021;54:521-6. Available from: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0041-1740289 [Last accessed on 2023 Jul 04].

16. Coleman E. Types and treatment of hair loss in men and women. Plast Aesthetic Nurs 2020;40:222-35. Available from: https://www.ingentaconnect.com/content/wk/psn/2020/00000040/00000004/art00019 [Last accessed on 2023 Jul 12].