

INFLUENCE OF PREDICTORS OF HAIR LOSS AMONG MEDICAL STUDENTS IN MANAS CITY, KYRGYZSTAN: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Hair loss (alopecia) is a multifactorial condition influenced by genetic, hormonal, nutritional, psychological, and environmental factors. Medical students represent a particularly vulnerable population due to prolonged academic stress, sleep deprivation, dietary irregularities, and, in the context of international medical programs, exposure to new environmental conditions including changes in water quality.

Objective: This study aimed to assess the prevalence and self-perceived predictors of hair loss among medical students in Manas City, Kyrgyzstan, and to examine the impact of hair loss on students' self-confidence and health-seeking behavior.

Methods: A cross-sectional study was conducted from November 1 to November 15 among 582 voluntarily participating medical students in Manas City, using an online, self-administered Google Form questionnaire encompassing both open- and closed-ended questions. Descriptive statistics were used to summarize all variables.

Results: The majority of respondents were aged 17–22 years (80.5%), and females predominated (67.35%, n=392). Water quality was identified as the primary perceived trigger (68.56%) and main cause (65.1%) of hair loss, far exceeding stress (10.82%), diet (10.65%), and poor hair care (7.04%). Approximately 300 students first noticed hair loss within days of arrival in Manas City, supporting an environmental onset. Hair loss adversely affected self-confidence in 74.2% of respondents, yet only 13.9% sought professional consultation.

Conclusion: Hair loss is prevalent among medical students in Manas City and is predominantly attributed to local water quality, representing a distinctive environmental predictor not prominently featured in comparable international studies. Comprehensive interventions encompassing water quality assessment, stress management programs, nutritional support, and dermatological access are urgently recommended.

Keywords: hair loss, alopecia, medical students, water quality, stress, predictors

ВЛИЯНИЕ ФАКТОРОВ, ПРЕДСКАЗЫВАЮЩИХ ВЫПАДЕНИЕ ВОЛОС СРЕДИ СТУДЕНТОВ-МЕДИКОВ В ГОРОДЕ МАНАС, КЫРГЫЗСТАН: ПОПЕРЕЧНОЕ ИССЛЕДОВАНИЕ

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АННОТАЦИЯ

Введение: Выпадение волос (алопеция) — это многофакторное состояние, на которое влияют генетические, гормональные, пищевые, психологические и экологические факторы. Студенты-медики представляют собой особенно уязвимую группу населения из-за длительного академического стресса, недосыпания, нарушений питания и, в контексте международных медицинских программ, воздействия новых условий окружающей среды, включая изменения качества воды.

Цель: Данное исследование направлено на оценку распространенности и субъективно воспринимаемых факторов, предсказывающих выпадение волос среди студентов-медиков в городе Манас, Кыргызстан, а также на изучение влияния выпадения волос на самооценку студентов и их поведение в отношении обращения за медицинской помощью.

Методы: Было проведено поперечное исследование с 1 по 15 ноября среди 582 добровольно участвовавших студентов-медиков в городе Манас с использованием онлайн-анкеты Google Forms, включающей как открытые, так и закрытые вопросы. Для обобщения всех переменных использовалась описательная статистика.

Результаты: Большинство респондентов были в возрасте 17–22 лет (80,5%), и преобладали женщины (67,35%, n=392). Качество воды было определено как основной субъективно воспринимаемый фактор, провоцирующий (68,56%) и являющийся главной причиной (65,1%) выпадения волос, значительно превосходящий стресс (10,82%), диету (10,65%) и плохой уход за волосами (7,04%). Примерно 300 студентов впервые заметили выпадение волос в течение нескольких дней после прибытия в город Манас, что подтверждает влияние окружающей среды. Выпадение волос негативно сказалось на самооценке 74,2% респондентов, однако только 13,9% обратились за профессиональной консультацией.

Вывод: Выпадение волос широко распространено среди студентов-медиков в городе Манас и в основном связано с качеством местной воды, представляя собой особый экологический фактор, не часто упоминаемый в сопоставимых международных исследованиях. Срочно необходимы комплексные меры, включающие оценку качества воды, программы управления стрессом, нутритивную поддержку и доступ к дерматологической помощи.

Ключевые слова: выпадение волос, алопеция, студенты-медики, качество воды, стресс, факторы риска

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1. INTRODUCTION

Hair represents one of the most rapidly renewing tissues in the human body, second only to bone marrow in its rate of cell proliferation. Beyond its biological function, hair plays a pivotal role in appearance, self-image, and psychosocial well-being, particularly among women. Under normal physiological conditions, an individual sheds approximately 50–100 hairs daily; when this threshold is exceeded, the condition is clinically recognized as alopecia, or pathological hair loss [1].

The etiology of alopecia is multifactorial, encompassing genetic predisposition, hormonal fluctuations, nutritional deficiencies, environmental and seasonal variables, and psychological stressors. Among these, psychological stress has been consistently identified as a major precipitating factor. Stress activates the hypothalamic–pituitary–adrenal (HPA) axis, leading to elevated cortisol secretion that disrupts the normal hair growth cycle by prematurely transitioning hair follicles from the anagen (growth) phase to the telogen (resting) phase—a process culminating in excessive shedding, known as telogen effluvium [1].

In females, multiple distinct clinical subtypes of alopecia are recognized, including female pattern hair loss (FPHL), telogen effluvium, trichotillomania, traction alopecia, iron deficiency–related alopecia, and central centrifugal cicatricial alopecia. Telogen effluvium, characterized by diffuse temporary shedding, typically manifests two to three months following a significant physiological or psychological stressor, such as childbirth, major illness, surgical intervention, restrictive dieting, or severe emotional trauma. Trichotillomania, by contrast, is an impulse-control disorder involving repetitive hair-pulling behavior, commonly reported among adolescent females. Mechanical damage from habitual use of styling tools and traction from hairstyling practices also contribute to hair breakage and structural loss. Given hair's profound psychosocial significance—particularly its role in feminine identity—alopecia frequently precipitates emotional distress, diminished self-esteem, and impaired overall well-being [2].

Medical students constitute a high-risk population for stress-related hair loss, given their sustained exposure to intense academic demands, disrupted sleep patterns, emotional strain, and potential hormonal dysregulation. Moreover, international medical students studying abroad encounter the additional challenge of environmental adaptation, including changes in climate, diet, and water composition, each of which may independently or collectively exacerbate hair shedding [2].

Epidemiological evidence from comparable settings underscores the significance of this issue. A large-scale study of 3,129 undergraduate students across 20 Chinese provinces reported a hair loss prevalence of 39.2%, with significant risk factors including female gender (OR = 12.13), family history of hair loss (OR = 1.81), scalp itching (OR = 2.26), oily hair (OR = 1.30), sleep disorders (OR = 1.37), and depression (OR = 1.41) [3]. In Lahore, Pakistan, 85.67% of 300 medical students reported hair loss, with the majority attributing it to moderate-to-severe academic stress [4]. Similarly, a Karachi-based study of 353 participants found that 76.2% reported hair loss, with stress (35.1%), inadequate hair care (28.9%), poor diet (25.2%), and genetics (11.0%) identified as primary contributing factors; home remedies were the dominant management strategy (45.6%), and 30.9% did not seek any treatment [5].

Given the paucity of data from Central Asian medical student populations and the unique environmental context of Manas City, this study was designed to assess the prevalence and self-perceived predictors of hair loss among medical students in Manas, Kyrgyzstan, and to examine its impact on self-confidence and health-seeking behavior. The findings are intended to inform targeted preventive strategies and promote holistic student well-being within international medical education settings.

2. METHODOLOGY

2.1 Study Design and Setting

This cross-sectional study was conducted among medical students enrolled at Manas City, Kyrgyzstan. The study period extended from November 1 to November 15.

2.2 Study Population and Sampling

A convenience sample of 582 medical students participated voluntarily. The questionnaire was distributed online via Google Forms. All currently enrolled medical students at the institution who voluntarily consented to participate were eligible. No exclusion criteria based on year of study or gender were applied.

2.3 Study Instrument

A structured, self-administered questionnaire comprising both open- and closed-ended items was developed for the study. Domains assessed included sociodemographic characteristics (age, gender), hair loss onset and perceived triggers, stress levels (self-rated on a 1–10 scale), family history of hair loss, daily hair care practices, frequency of hair washing, changes in hair texture and color, comorbid health conditions, impact on self-confidence, and professional health-seeking behavior.

2.4 Statistical Analysis

Data were summarized using descriptive statistics. Frequencies and percentages were computed for all categorical variables. Findings are presented in tabular and narrative format.

2.5 Ethical Considerations

Student participation was entirely voluntary and anonymous. No personally identifying information was collected. Ethical conduct was maintained in accordance with institutional guidelines.

3. RESULTS

3.1 Demographic Profile

A total of 582 students participated. The majority were in early adulthood: 41.8% (n=243) were aged 17–19 years, 38.7% (n=225) were aged 20–22 years, 17.5% (n=102) were aged 23–25 years, and 2.1% (n=12) were aged 26–28 years. Regarding gender distribution, 392 respondents (67.35%) were female and 190 (32.65%) were male (Table 1).

Table 1. Gender distribution of study participants (n=582)

Gender	Frequency (n=582)	Percentage (%)
Female	392	67.35%
Male	190	32.65%

3.2 Onset of Hair Loss After Arrival in Manas City

Regarding the onset of hair loss following arrival in Manas City, approximately 300 students (51.5%) first noticed hair loss within the first few days. Approximately 100 students (17.2%) observed hair loss after a few months, while fewer than 50 students reported no hair loss and fewer than 20 reported onset only after several years. This distribution indicates a rapid, environmentally driven onset for the majority of respondents.

3.3 Stress Levels

Self-reported stress was predominantly moderate: 59.6% of respondents rated their stress between 4 and 6 on a 10-point scale, 25.6% reported low stress (1–3), and 14.8% reported

high stress (7–10). While high stress was least prevalent, the combined moderate-to-high stress category encompassed 74.4% of respondents.

3.4 Family History of Hair Loss

The majority of respondents (approximately $n=490$, 84.2%) reported no family history of hair loss. A smaller proportion (approximately $n=70$, 12.0%) confirmed a positive family history, and the remainder were uncertain. These findings suggest that genetic predisposition plays a limited primary role in this cohort.

3.5 Hair Care Practices

The most prevalent hair care routine among respondents was the use of shampoo only (38.8%), followed by the combination of oil, shampoo, and conditioner (36.6%). A routine incorporating oil, shampoo, conditioner, and hair mask or serum was employed by 13.4% of participants, while the least common regimen was shampoo and conditioner alone (11.2%), reflecting a diverse spectrum of hair care behaviors.

3.6 Perceived Hair Loss Triggers and Main Causes

Water quality was overwhelmingly identified as the primary perceived trigger of hair loss, cited by 399 respondents (68.56%), followed by stress (10.82%, $n=63$), diet (10.65%, $n=62$), poor hair care (7.04%, $n=41$), and other factors (2.92%, $n=17$) (Table 2). When respondents were asked to identify what they believed to be the main cause of their hair loss, water again predominated (65.1%, $n=379$), followed by diet (12.0%, $n=70$), stress (11.5%, $n=67$), poor hair care (7.2%, $n=42$), and other causes (4.1%, $n=24$) (Table 3).

Table 2. Perceived triggers of hair loss among respondents

Perceived Trigger	Frequency (n=582)	Percentage (%)
Water quality	399	68.56%
Stress	63	10.82%
Diet	62	10.65%
Poor hair care	41	7.04%
Other	17	2.92%

Table 3. Main perceived cause of hair loss among respondents

Perceived Main Cause	Frequency (n=582)	Percentage (%)
Water quality	379	65.12%
Diet	70	12.03%
Stress	67	11.51%
Poor hair care	42	7.22%
Other	24	4.12%

3.7 Impact on Confidence and Health-Seeking Behavior

Hair loss was reported to adversely affect self-confidence in 74.2% of respondents, with only 25.8% indicating no impact on self-esteem. Despite this substantial psychosocial burden, the majority (86.1%) had not sought professional consultation for hair loss. Only 13.9% had consulted a healthcare professional, highlighting a significant gap between the burden of the condition and formal health-seeking behavior.

3.8 Comorbidities and Hair Texture Changes

Approximately 400 respondents (68.7%) reported no concurrent health conditions, while approximately 150 (25.8%) indicated comorbid conditions. Regarding hair quality changes, 314 respondents (53.9%) noticed alterations in hair texture or color since arriving in Manas City, compared with 268 (46.1%) who observed no such changes (Table 4).

Table 4. Self-reported changes in hair texture and color

Noticed Change in Hair Texture / Color	Frequency	Percentage (%)
Yes	314	53.95%
No	268	46.05%

4. DISCUSSION

The present study examined the multifactorial etiology of hair loss among 582 medical students in Manas City, Kyrgyzstan, integrating biological, psychological, environmental, and behavioral determinants within the theoretical framework outlined in the introduction. Hair loss is recognized as a stress-sensitive process mediated in part by HPA axis hyperactivation, and its prevalence in this young academic population is consistent with existing literature. Approximately 80% of participants were in early adulthood (aged 17–22 years), a demographic consistently identified in the literature as particularly vulnerable to stress-related alopecia due to concurrent academic pressures, lifestyle transitions, and hormonal changes. The Chinese undergraduate study similarly reported a hair loss prevalence of 39.2% in this age group, corroborating the susceptibility of young adults [3].

The gender distribution in this study—67.35% female—is consistent with evidence identifying female sex as a significant risk factor for alopecia [2], attributable to hormonal dynamics, heightened cosmetic awareness, and greater self-reported sensitivity to stress-related somatic symptoms. This aligns with the introduction's emphasis on the profound psychosocial significance of hair among women, particularly its role in self-identity and emotional well-being.

The most distinctive and clinically significant finding of this study is the overwhelming attribution of hair loss to water quality: 68.56% identified water as the primary trigger and 65.1% as the main perceived cause. This pattern diverges substantially from findings in the Chinese [3] and Pakistani studies [5], where genetics, oily scalp, sleep disorders, depression, and diet were more prominent. The rapid onset of hair loss within days of arrival in Manas City, reported by approximately 300 students, strongly implicates environmental adaptation as a proximate cause. Local water may contain elevated mineral concentrations, heavy metals, or altered pH levels that induce scalp irritation, follicular inflammation, and

premature shedding. This hypothesis is further supported by the 53.9% of respondents who noted changes in hair texture and color following arrival.

Psychological stress, consistently highlighted in the introduction as a central precipitant of telogen effluvium, was reported in this cohort as a moderate-to-high experience by 74.4% of students. However, only 10.82% identified stress as their primary trigger, suggesting that environmental influences—particularly water quality—may overshadow or mask stress-related pathways in this specific context. Nonetheless, the Lahore study [4], in which 85.67% of students experienced hair loss correlated with moderate-to-severe stress, and the Karachi study [5], where 35.1% cited stress as a primary factor, together demonstrate that stress remains a dominant driver in comparable medical student populations.

The impact of hair loss on self-confidence was substantial, affecting 74.2% of respondents, yet only 13.9% sought professional medical consultation—a pattern reflecting the Karachi study's finding that 30.9% pursued no treatment whatsoever [5]. This gap between psychosocial burden and health-seeking behavior may reflect stigma, inadequate awareness of available dermatological services, or financial barriers. Given that hair loss significantly impacts student well-being and potentially academic performance, bridging this gap through institutional health programs is a public health priority.

5. CONCLUSION AND RECOMMENDATIONS

This cross-sectional study of 582 medical students in Manas City, Kyrgyzstan, reveals a high prevalence of self-reported hair loss primarily attributed to local water quality, with stress and diet as secondary factors. Female students are disproportionately affected, and the impact on self-confidence is pronounced. The rapid onset of hair loss following arrival in Manas City and the high rate of hair texture changes point to environmental adaptation—particularly altered water composition—as the predominant proximate trigger. Despite the considerable psychosocial burden, formal health-seeking behavior remains low.

The following evidence-based recommendations are proposed:

1. **Environmental Assessment:** Water quality testing should be conducted to assess mineral content, heavy metal levels, and pH. Filtration systems or treated water supplies should be made available to students.
2. **Stress Management:** Structured programs incorporating mindfulness, resilience training, and professional counseling services should be integrated into the academic schedule.
3. **Nutritional Support:** Balanced dietary guidance, supplementation advice (particularly for iron, zinc, and vitamins B and D, and on-campus nutritional counseling should be provided.
4. **Hair Care Education:** Workshops on scalp hygiene, gentle cleansing practices, and avoidance of heat-based styling tools should be organized.
5. **Dermatological Access:** Regular dermatology clinics and awareness campaigns should be established to reduce stigma, promote early consultation, and close the treatment gap. Future prospective studies with objective clinical assessment of hair loss severity and laboratory analysis of water composition are warranted to validate these findings and inform institutional policy.

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