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Epidemiology and Assessment of Hair Loss among Adults in Sulaimani Governorate: A Sample Cohort Study

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Background: Hair loss, a condition with significant psychological repercussions, is influenced by various epidemiological factors. The present study aims to investigate epidemiological factors and evaluate hair loss in adults in Sulaimani Province.

Method: This analytical cross-sectional cohort study was conducted in 2023. Multi-clinic centers across Sulaimani City were selected for a follow-up study involving more than 150 participants. These individuals were divided into three groups based on their treatment type: PRP (n = 50), topical applications (n=50), and pharmacological treatments (n = 50). Each group was monitored over a period exceeding three months, during which clinical and demographic data were meticulously gathered.

Result: The analysis of this study identified several risk factors for hair loss with varying odds ratios: weight (OR = 1.33, 33%), height (OR = 1.01, 1%), body mass index (BMI) (OR = 1.008, 0.8%), familial history of hair loss (OR = 1.10, 10%), recent surgical procedures (OR = 1.03, 3%), and history of anesthesia (OR = 1.02, 2%). The treatments showcased effectiveness in reducing hair loss and were correlated with a significant decrease in hair loss during every session. A noticeable reduction in daily hair loss was observed among male and female participants in all therapy groups (PRP, topical, and pharmaceutical), indicating a positive impact on mitigating hair loss through these treatment modalities.

Conclusion: This study's findings suggest that multiple factors contribute to hair loss. Identifying, managing, and implementing timely interventions can significantly reduce hair loss. Interventions including PRP therapy, topical treatments, and pharmacological approaches were effectively shown to reduce hair loss in the study participants.

Keywords: Androgenetic alopecia, Hair loss, PRP, oral supplement, Topical, IRAQ

1. Introduction: The relationship between luxurious hair and attributes such as beauty, youth, and health is widely recognized in contemporary societies (1, 2). Despite hair loss being a prevalent condition that causes both cosmetic and psychosocial distress, it has garnered limited attention, with few studies addressing its prevalence and severity, particularly in Iraq (3). Male pattern hair loss, or Androgenetic Alopecia (AGA), represents the most common form of hair loss in men, affecting approximately half of the male population by middle age (4). This condition, also prevalent in women, leads to a distinctive pattern of hair loss where the hairline recedes to form an "M" shape and thinning occurs at the crown, often progressing to partial or complete baldness (5).

Hair loss in men does not often get much serious medical attention, but it can also lead to psychological discomfort such as anxiety and depression just through the effect of identity disturbance (6). Many health problems such as coronary heart disease, insulin resistance diseases like obesity and diabetes, high cholesterol, prostate enlargement, cancer of the prostate, and hypertension have been linked to Androgenetic Alopecia. This kind of hair loss is commonly associated with increased Polycystic Ovary Syndrome (PCOS) cases in women, where PCOS hormonal imbalances can result in various signs and symptoms such as skin conditions (acne and hirsutism), weight gain, and irregular menstruation (7). Androgenic alopecia is an extremely common condition that according to some estimates affects 50 million men and 30 million women in the United States alone. It can begin as early as a person's teens, with risk increasing with age; over 50 percent of men over 50 experience some degree of hair loss. Post-menopause is typically when women are most likely to experience this hair loss (8).

The onset age of androgenetic alopecia in men is variable, generally occurring in their mid-20s, with prevalence and severity increasing with age. Due to its association with circulating androgens, this form of hair loss does not occur in prepubescent children and is most prevalent among middle-aged to elderly white men (9). Approximately 30% of white men are affected by age 30 years, at least 50% by age 50 years, and 80% by age 70 years (10). Approximately 30% of white men are affected by the age of 30 years, at least 50% by the age of 50 years, and 80% by the age of 70 years. In women, the pattern of hair loss varies among different populations and increases with age. Female Pattern Hair Loss (FPHL) may begin during the reproductive years, with more severe cases noticeable at puberty, and a second peak incidence around menopause, between 50 and 60 years of age (11).

The pathogenesis of androgenic alopecia in males involves a marked decrease in the density of terminal hairs and an increase in vellus hairs (12). The pattern of baldness in men has been linked to androgens, particularly dihydrotestosterone (DHT) (13). The inheritance pattern of androgenic alopecia in males appears to be genetic, though the specific mode of inheritance remains unclear (14).

Given the widespread prevalence of hair loss and its impact on an individual's appearance, it is critical to investigate all epidemiological factors as well as their clinical manifestations. Thus, this study aims to explore these factors and assess hair loss among adults in Sulaimani Province.

2. Method

2.1. Study design: This cohort analytical cross-sectional study (follow-up over three months) was conducted in Sulaimani Governorate and its districts in 2023.

2.2. Sampling procedure: A method of stratified sampling was utilized to gather data from the target population in the study. The total sample size was determined to be 1438, and it was distributed based on the population size of each district: Sulaimani City (N=498), Chamchamal (N=110), Ranya (N=250), Dukan (N=100), Kalar (N=250), Darbandixan (N=110), and Saidsadq (N=120). Samples were then randomly chosen from each district. For the follow-up phase, multiple clinic centers in Sulaimani city were selected, with over 150 cases divided into three groups according to treatment type: PRP (N=50), Topical (N=50), and oral supplement (N=50). Each group was monitored for a period exceeding three months.

2.3. Sample size: The sample size was calculated using the formula with a presumed disease prevalence of 0.50, a precision of 0.03, a population of 2,123,000, a z-score of 1.96 for a confidence level of 97%, and a p-value of 0.05, resulting in a required sample size of 1438.

Inclusion criteria were both females and males older than 18 years in generally good health who provided informed consent. Exclusion criteria included participants with any form of scalp disease such as alopecia areata, Alopecia totalis, alopecia universalis, discoid lupus erythematosus, and individuals under 18 years of age.

2.4. Data Collection Process

2.4.1. First step :(before going to field) Stratified and simple random sampling methods were utilized to gather necessary data. Ten centers were randomly selected from a total of fifty centers within the Sulaimani Governorate, each center reporting a range of 1-10 patients experiencing hair loss daily.

2.4.2. Second step: (Field work and data collection) A questionnaire comprising two sections was developed; the first section collected data on the population and the second on the follow-up group. Respondents provided information directly, which was recorded on the form. Additional data for the follow-up group included laboratory data, stage of baldness, and treatment response, all collected personally by the researcher.

Laboratory tests including TSH, T3, T4, full blood count, blood film, serum ferritin, serum iron, serum vitamins, serum prolactin, serum LH, and serum FSH were conducted as per the manufacturer’s protocols in a laboratory with a standardized quality control system.

Hair status was assessed using the Ludwig scale for females and the Norwood-Hamilton scale for males as part of the clinical examination. Treatment response for each participant was documented over three months with details on treatment type, frequency, duration, and progress captured through sequential photographs.

2.5. Questionnaire: The questionnaire comprised seven parts, with the first part providing information on the participants' sociodemographics (age, ethnicity, socio-economic status, sex, occupation, education, marital status, family size, and residence). The second part of the questionnaire assessed the stage of hair loss, specifically focusing on areas of the head experiencing hair loss and those experiencing rapid hair loss. The third part revealed the risk factors (family history, weight, height, BMI, diet, general operation, hair shampooing, water source, chemical exposure, and use of oral supplements). The last section of the questionnaire was made up of data regarding treatment response (the type and duration of treatments that they used, photographs that were taken, and how their hair follicles developed).

Statistical analysis Data were entered and analyzed using SPSS version 22 (IBM Statistics. Inc.). Descriptive and analytic statistics, including frequencies, percentages, means, independent-sample t-tests, one-way ANOVA, and Chi-square tests were performed. A p-value of ≤ 0.05 was considered statistically significant.

2.6. Ethical considerations Ethical adherence was maintained in line with the Helsinki Declaration (15) and the ethical standards of the Technical College of Health at Sulaimani Polytechnic University and the General Directorate of Health in Sulaymaniyah. Informed consent was obtained, participation was voluntary, and confidentiality of data was strictly upheld.

3. Results: This study analyzed data from 150 patients, consisting of 70 (46.7%) males and 80 (53.3%) females, to investigate variables such as hair loss, influencing factors, and mitigative actions. The mean age of male participants was 25.87 ± 6.797 years, compared to 31.74 ± 9.242 years for females, a statistically significant age disparity ($P \leq 0.001$). Employment roles varied significantly: 10 (14.4%) of males were teachers, 35 (50%) were employers, eight (11.4%) were housewives, and 17 (31.2%) were in diverse occupations. Conversely, among females, 10 (12.5%) were teachers, 19 (23.8) were employers, 42 (52.5%) were housewives, and 9 (11.2%) occupied various other positions ($P \leq 0.001$). Marital status also varied significantly: 13 (18.6%) of males were married compared to 37 (46.3%) of females, and 57 (81.4) of males were single compared to 34 (42.5%) of females ($P \leq 0.001$) (Table 1).

Table (1). Distribution of demographic variables in the follow-up sample of Sulaimani City to investigate aspects of hair loss

Variable	Class	Male	Female	P-Value**

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Age		**25.87±6.797***	**31.74±9.242**	**0.001**
Family Size		**4.73±1.483**	**4.79±1.741**	**0.825**
Sex		**70 (46.7)**	**80 (53.3)**	**0.9**
Economic Status	**Low**	**15 (21.4)**	**14 (17.5)**	**0.499**
	Intermediate	**45 (64.2)**	**54 (67.5)**	
	High	**10 (14.4)**	**12 (15)**	
Occupation	**Teacher**	**10 (14.4)**	**10 (12.5)**	**0.001**
	Employer	**35 (50)**	**19 (23.8)**	
	Housewife	**8 (11.4)**	**42 (52.5)**	
	Other	**17 (31.2)**	**9 (11.2)**	
Education Level	**Illiterate**	**1 (1.4)**	**0**	**0.32**
	Primary	**5 (7.1)**	**10 (12.5)**	
	Secondary	**24 (34.3)**	**17 (22.4)**	
	Institute	**14 (20)**	**21 (27.6)**	
	University	**25 (35.7)**	**26 (34.2)**	
	Post Graduated	**1 (1.4)**	**4 (5.3)**	
Marital Status	**Married**	**13 (18.6)**	**37 (46.3)**	**0.001**
	Single	**57 (81.4)**	**34 (42.5)**	
Residency	**City Center**	**59 (84.3)**	**66 (82.5)**	**0.829**
	Districts	**11 (15.7)**	**14 (17.5)**	

*Mean ± SD, **P-value chi-square

Table 2 displays the risk factors for hair loss in the following individuals: Weight: 33% (OR = 1.33); Height: 1% (OR = 1.01); Body Mass Index (BMI): 0.8% (OR = 1.08); history of hair loss in the family: 10% (OR = 1.10); recent general operation: 3% (OR = 1.03); and anesthesia history: 2% (OR = 1.02), increased the odds ratio or risk of hair loss (Table 2).

Variable	**Class**	**Male**	**Female**	**OR CI95%**	**P-Value****
Weight		**79.67±11.501***	**69.43±10.126**	**1.33**	**0.001**

				1.18-1.56	
Height		179.3±6.060	164.66±7.141	1.01 1.005-1.14	0.001
BMI		24.855±5.674	25.814±.6.879	1.008 1.004-1.10	0.001
Family History Of Hair Loss	Yes	44 (62.9)	24 (30)	1.10 1.05-1.18	0.001
	No	26 (37.1)	56 (70)		
Are You Actively Dieting	Yes	3 (4.3)	6 (7.5)	-	0.503
	No	67 (95.7)	94 (92.5)		
If Yes, What Type Of Diet	Low Carbohydrate	1 (33.3)	2 (33.3)	-	0.179
	Keto	0	1 (16.7)		
	Intermittent Fasting	0	3 (50)		
	Other	2 (66.7)	0		
Are You A Vegetarian Or Vegan	Vegetarian	0	0	-	N/S
	Vegan	0	0		
	No	70 (100)	80 (100)		
Recent General Operation	Yes	23 (32.9)	48 (60)	1.03 1.004-1.13	0.001
	No	47 (67.1)	32 (40)		
If Yes, Type Of Anesthesia	No	47 (67.1)	32 (40)	1.02 1.006-1.10	0.001
	General Anesthesia	22 (34.1)	40 (50)		
	Regional Anesthesia	1 (1.4)	7 (8.7)		
	Both	0	1 (1.3)		

Table (2). Distribution of Risk factor in the follow-up sample of Sulaimani City to investigate aspects of hair loss

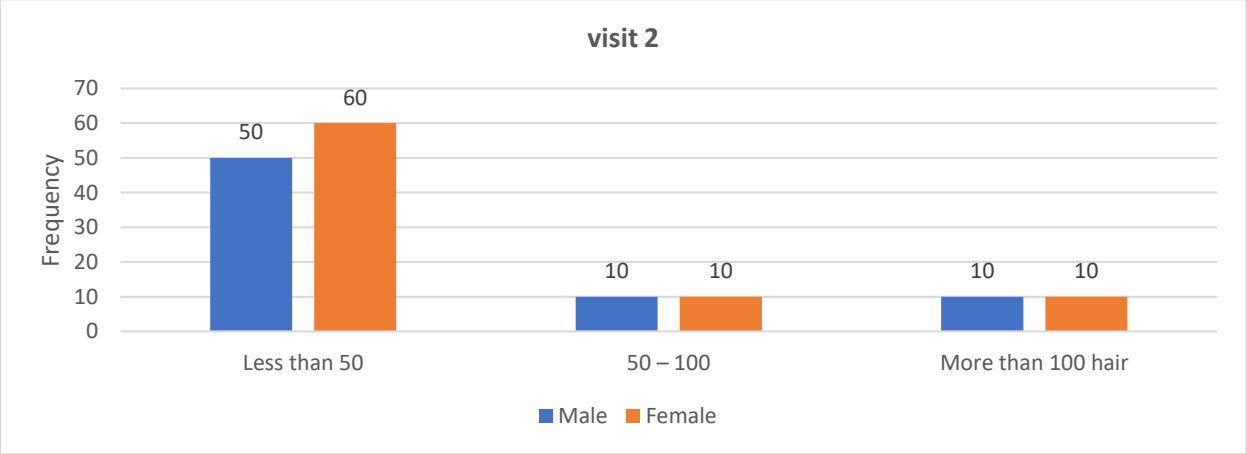
*Mean ± SD, **P-value chi-square

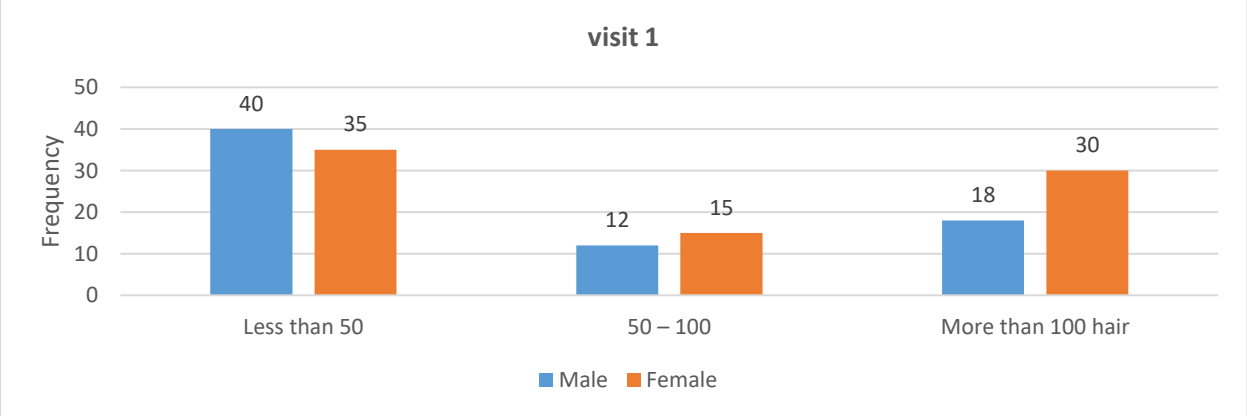
Figure 1 displays the treatment results from visits 1, 2, and 3. The results showed that revealing that 40 (57.1%) males and 35 (43.8%) females lost less than 50 hair follicles in a single day. Twenty (17.1%) males and 15 (18.9%) females lost between 50 and 100 hair follicles, while 18

(25.8%) males and 30 (37.3%) females lost more than 100 hair follicles. Response to treatment on the first visit had a notable difference between males and females (P≤0.001).

The findings revealed that 50 (71.4%) males and 60 (75%) females exhibited less than 50 hair follicle loss in a single day. Meanwhile, 10 (14.3%) males and 10 (12.5%) females encountered hair follicle loss ranging from 50 to 100; additionally, 10 (14.3%) males and 10 (12.5%) females experienced hair follicle loss surpassing 100. There was a notable discrepancy in the response to treatment between males and females during the second visit (P≤0.001).

The results showed that 65 (93%) males and 74 (92.5%) females had less than 50 hair follicles falling in one day. The amount of hair follicle loss was 50–100 in three (4.3%) males and four (5) females, and hair loss of more than 100 per day was in two (2.7%) males and two (2.5%) females. Response to treatment on the third visit had a significant difference between males and females (P≤0.04).





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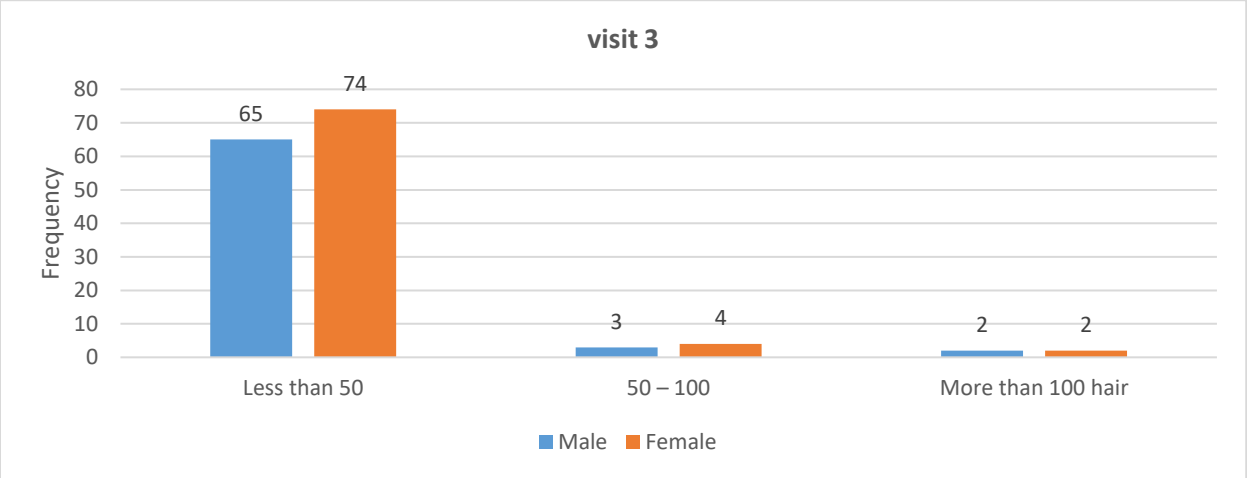

Figure (1): Response to treatment (visit 1, visit 2 and visit 3) in the follow-up sample of Sulaimani City to investigate aspects of hair loss (P≤0.001)

The analysis of treatment responses over three visits, as detailed in Table 3, demonstrates a statistically significant reduction in hair loss (P≤0.001). Initially, 40 men (57.1%) reported experiencing fewer than 50 hair loss incidents per day. This figure rose to 50 men (71.4%) in the second consultation and further increased to 65 men (93%) by the third consultation. Conversely, 35 women (43.8%) noted fewer than 50 hair loss incidents per day during the initial visit, with numbers increasing to 60 women (75%) in the second visit and 74 women (92.5%) by the third visit. A notable sex difference in treatment response was observed. Additional data is presented in Table 3.

Table (3). General comparison (according Sex) of response to treatment was performed in three visits

Variable	Class	Male			Female			P-Value**
		Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	
Amount Of Hair Follicles Loss In A Day	Less Than 50	40 (57.1) *	50 (71.4)	65 (93)	35 (43.8)	60 (75)	74 (92.5)	0.001
	50 – 100	12 (17.1)	10 (14.3)	3 (4.3)	15 (18.9)	10 (12.5)	4 (5)	0.001
	More Than 100 Hair	18 (25.8)	10 (14.3)	2 (2.7)	30 (37.3)	10 (12.5)	2 (2.5)	0.001

*Frequency (%) **P-value Chi-square

A broader evaluation across the three visit revealed that initially, 75 individuals (50%) experienced fewer than 50 hair loss incidents daily, 27 individuals (18%) reported 50-100 incidents, and 48 individuals (32%) noted more than 100 incidents per day. By the second visit, 110 individuals (73.4%) reported fewer than 50 hair loss incidents per day, whereas 20 (13.3%) reported 50-100, and another 20 (13.3%) reported more than 100 incidents. In the third visit, 143 individuals (92.1%) experienced fewer than 50 hair loss incidents daily, 7 (4.6%) reported 50-100 incidents, and 5 (3.3%) experienced more than 100. The data indicates a significant reduction in hair loss across the visits (P≤0.001). Further details are available in Table 4.

Table (4). Comparison of response to treatment was performed in three visits

Hair Follicles Loss	Class	Visit 1	Visit 2	Visit 3	P-Value**
Amount Of Hair Follicles Loss In A Day	Less Than 50	75 (50%)*	110 (73.4%)	143 (92.1%)	0.001
	50 – 100	27 (18%)	20 (13.3)	7 (4.6%)	
	More Than 100 Hair	48 (32%)	20 (13.3%)	5 (3.3%)	

*Frequency (%) **P-value Chi-square

Regarding different treatment modalities, the initial visit data showed that under PRP treatment, 40 individuals (26%) experienced fewer than 50 hair loss incidents daily, 25 (17%) reported between 50-100, and 85 (57%) experienced more than 100. In topical treatment, 35 individuals (24%) had fewer than 50 incidents daily, 29 (19%) had between 50-100, and 86 (57%) experienced more than 100. In oral supplement, 32 individuals (22%) experienced fewer than 50 incidents daily, 36 (24%) had between 50-100, and 82 (54%) experienced more than 100. These findings are detailed in Table 5.

Table (5). Comparison of response to treatment according Type of treatment

Type Of Treatment	Visit 1			Visit 2			Visit 3		
	More Than 100 Hair	50 – 100	Less Than 50	More Than 100 Hair	50 – 100	Less Than 50	More Than 100 Hair	50 – 100	Less Than 50
PRP	85 (57%)*	25 (17%)	40 (26%)	45 (30%)	30 (20%)	75 (50%)	5 (3%)	15 (10%)	130 (87%)
Topical	86 (57%)	29 (19%)	35 (24%)	50 (34%)	20 (13%)	80 (53%)	10 (7%)	15 (10%)	125 (83%)
Oral Supplement	82 (54%)	36 (24%)	32 (22%)	45 (30%)	20 (13%)	85 (57%)	8 (5%)	10 (7%)	132 (88%)

*Frequency (%) **P-value Chi-square

The progression of baldness across three visits also varied. Initially, 46 individuals were in the third stage of baldness, 34 in the fifth, and 26 in the fourth. By the second visit, 37 individuals had progressed to the second stage, 54 to the sumo stage, and 31 remained in the fourth stage. In the third visit, 40 individuals were in the first stage, 90 in the second, and 20 returned to the third stage. This progression is documented in Table 6.

Table (6). Comparison of Stage of baldness was performed in three visits

Baldness	Class	Visit 1	Visit 2	Visit 3
Stage Of Baldness	One	3	-	40
	Two	17	37	90
	Three	46	54	20
	Four	26	31	-
	Five	34	25	-
	Six	15	-	-
	Seven	12	-	-
	Eight	7	-	-

4. Discussion

The current study aimed to explore the epidemiology of hair loss and assess the efficacy of PRP, Topical, and oral supplement in 150 individuals from the Sulaimani population in Iraq. Various risk factors for hair loss were analyzed, including weight, height, BMI, family history of hair loss, history of surgical procedures, and history of anesthesia. The subjects were followed-up through four visits consisting of an initial assessment and three subsequent monthly check-ins, revealing that the interventions were successful, as there was a notable decrease in hair loss at each visit. This decline in daily hair loss was significant in both the male and female participants. The application of PRP, Topical and oral supplement led to a considerable reduction in daily hair loss, demonstrating the beneficial impact of these treatment approaches in alleviating hair loss. Moreover, the patients experienced a change in their balance stage following the utilization of these therapeutic techniques.

The sex distribution within the study indicated that the majority of the individuals involved were female, with a mean age of 28 years. Research conducted in England by Harries et al. (2022) to outline the epidemiology of alopecia, its prevalence, demographic characteristics of patients, and healthcare utilization patterns, revealed that the mean age of male patients was 34 years, while for females it was 31 years, surpassing the mean age observed in the current study. Nevertheless, the predominance of female participants is consistent with the findings of the current study (16). This disparity in the mean age could potentially be attributed to differences in the demographic structure

of the populations under investigation. Another study by Abd El Meged (2019) reported an age and sex distribution that matched the current study (17).

One of the significant risk factors for hair loss was a high BMI, which was shown to increase the risk of hair loss in the individuals studied. Consistent with the findings of the present study, Morinaga et al. (2021) demonstrated that obesity and high BMI could directly cause hair loss or do so indirectly through diseases associated with high BMI (18). Another risk factor is a family history of hair loss, which has been shown to increase the risk of hair loss by up to 10% in individuals. Research has shown that the rates of hair loss and hair loss patterns can be inherited from parents (19, 20). A study in South Korea confirmed these findings, indicating that a family history of hair loss could increase the risk of hair loss in offspring and subsequent generations (21).

Surgical procedures and anesthetic drugs have also been identified as risk factors, potentially causing hair loss due to telogen effluvium, which disrupts the natural follicle cycle (22, 23). A study in South Korea by Lee et al. (2023) showed that individuals with a history of surgery and general anesthesia have an increased risk of hair loss, consistent with the results of the present study (24).

The treatment methods used (PRP, Topical, and oral supplement) were associated with a reduction in daily hair loss in patients, demonstrating the positive effect of these therapies on reducing hair loss after each visit. A study in India by Monil et al. (2023) highlighted that drug treatments could effectively reduce hair loss and should be considered for managing hair loss (25). A systematic review by York et al. (2020) further supports the significant role of drugs in reducing hair loss (26).

The effect of topical treatments on hair loss reduction is consistent with the findings of this study. Reviews by Villani et al. (2021) and Minta et al. (2023) indicate that topical drugs are a suitable option for preventing or reducing hair loss in diverse individuals (27, 28). Another treatment used in the current study was PRP, which reduced hair loss in patients who underwent this treatment. Other studies closely correlate with the findings of the current study, indicating that PRP therapy could be considered a primary option for treating hair loss (29-31).

5. Conclusion

The results of the present study show that various factors may play a role in hair loss in individuals. Identifying, managing, and intervening in a timely and appropriate manner can be beneficial for reducing hair loss. Interventions implemented to reduce hair loss, including PRP, Topical, and oral supplement methods, were effective in reducing hair loss. Given the significant role of hair in individuals' appearance and the psychological impact of hair loss, identifying and developing new treatments in addition to current modern therapies could be highly beneficial.

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