Causes and treatments of hair loss: A cross-sectional study

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Abstract

Hair loss has a great impact on the self-esteem, attractiveness, and appearance of people in society. Genetics and stress are important factors in hair loss. Vitamin D has many receptors on the stem cells of a hair follicle. Also, vitamin B7 helps in the growth of hair follicles and prevents hair loss. Several diseases play a role in hair loss, including thyroid disorders. According to the type of hair loss pattern of the patient, special treatment can be prescribed for it. We were conducting a questionnaire-based survey on 309 people regarding the assessment of the common reasons and treatments they had for their hair loss. Statistical analyses were carried out using SPSS V-23.0. Descriptive statistics were applied to determine the frequencies and percentages. And results were written by interpreting the descriptive statistics.

Out of 309 people who were examined, 189 people had hair loss. Losing hair in the female population was a little more. 82% of the participants who had hair loss reported that their first-degree relatives experienced hair loss like them. It appeared that people with (RH+) had a higher incidence of hair loss. Hair loss among the participants was associated with thyroid dysfunctions. Participants with moderate stress levels had a higher incidence of hair loss. The majority of participants reported the positive impact of biotin, Vitamin D, and zinc on reducing hair loss. Hair loss has a profound negative impact on the mental health and social life of a person which can be a challenge for some people.

Keywords: *Hair loss; Stress; Vitamin D; Biotin; Minoxidil*

1. Introduction:

Hair loss has a great impact on the self-esteem, attractiveness, and appearance of people in society [1,2]. Hair loss has a great impact on the self-esteem and attractiveness of people who appear in society and turn plays an important role in the fate and future of people. Approximately men lose 50% and women 30% of their hair before death [3,4]. To express the pattern of hair loss in men and women, we must know that if the number of hairs that fall out daily is more than 50-100 pieces per day, we can say that the person has hair loss [5]. The pattern of hair loss is different in men and women. It is often androgenetic alopecia (AGA) in men and female pattern hair loss (FPHL) in women [3].

Genetics is one of the effective factors in hair loss, which is more common in men, and 50% of men suffer from it by the

age of 50 [6]. Nutritional causes can also be considered effective factors in hair loss. Vitamin D has many receptors on the stem cells of the hair follicle, it makes the hair follicle strong and affects the hair cycle. Therefore, the lack of this vitamin causes hair loss [7,8,9,10,11]. Also, vitamin B7 (Biotin) helps in the growth of hair follicles and prevents hair loss, so the sufficiency of this vitamin in the body causes the vitality of hair [12]. It seems that lack of iron in the diet is one of the other causes of hair loss, and it has been observed that the ferritin level in the serum of people with hair loss is lower than that of normal people [6,8,11]. Zinc is the cofactor of most enzymes and accelerates the recovery of damaged follicles. Therefore, its deficiency can be considered another cause of hair loss [12,13]. In addition to diet, stress is also one of the effective factors in hair loss and it is said that in a society where

most people are under mental tension and stress, hair loss is more evident [9,14,15,16].

Also, several diseases play a role in hair loss, including thyroid disorders. Hormones secreted by the thyroid play a big role in the body's metabolism. Therefore, disruption of their secretion causes illness and symptoms such as hair loss. As in hypothyroidism, due to disturbances in metabolism and energy production, hair cells turn off to prevent receiving energy and energy reaches other parts of the body, this causes hair loss [17].

The treatment of hair loss depends on various factors, including the patient's age and the amount of hair loss, and to achieve the desired response, the treatment must be continuous [18]. According to the type of hair loss pattern of the patient, a special treatment is prescribed for it. Among the most common treatments that are prescribed is the use of vitamins (such as vitamin D) and other medicinal supplements such as zinc and biotin [19]. One of the most effective and well-known drugs for reducing hair loss is minoxidil [20]. Taking low-dose minoxidil along with spironolactone is a suitable treatment option for hair loss [21].

Mesotherapy is another type of treatment that is used today for hair loss, cellulite, and skin rejuvenation. Mesotherapy is a technique in which substances such as minoxidil, multivitamins, thyroxine, and triiodothyronine are injected directly into the patient's skin for treatment. Of course, there is still no comprehensive and extensive information on the effectiveness of mesotherapy on hair treatment [22]. According to the above information, in this article, we will examine some of the common causes of hair loss and its treatment methods.

2. Materials and Methods:

2.1. Study design, period, and setting:

This was a cross-sectional questionnaire-based descriptive survey study conducted within 2 week period (from 4th July to 18th July 2022) among the community. This study has been carried out following Standards for Reporting Qualitative Research criteria and guidelines Ethical approval from the institutional review board of Rawalpindi Medical University was taken before the conduction of the study and data collection. We tried to collect all the people's information that was related to the research topic, and finally, we reached 36 questions based on the literature review.

2.2. Sampling technique and ethical consideration:

The convenient sampling technique was followed during the recruitment of the study population. All participants were properly informed about the nature and purpose of the given study and their consent was taken properly. The consent form was part of the response questionnaire and it was marked compulsory to fill out the consent before continuing with the remaining response form.

2.3. Study population and Sample size determination:

Tehran community was taken as population size and keeping a margin of error of 5%, a confidence interval of 95%, with a response distribution of 50%, a sample size of 309 people was calculated to answer this questionnaire. Out of these 309 people, 189 people had hair loss, which constituted our target population.

2.4. Study questionnaire and data collection technique:

The statistical analysis of the questionnaire was done only considering age as a limiting factor, and people below 18 years old were not included in this study. It should be noted that to respect the privacy of the respondents, asking for their names and identities in the questionnaire was avoided. Data was collected by providing hard copies of printed response forms to the participants giving each of them one hour to complete the form.

The questionnaire was built into five categories by reviewing the literature in such a way that it is possible to comprehensively investigate and analyze the common causes of hair loss along with the use of treatment methods and their effectiveness. Items of the questionnaire were categorized based on the following pattern: 1. Demographic characteristics: age, gender, marital status, socio-economic status, 2. The amount of daily hair loss, and the history of hair loss in the family, 3. Lifestyle and haircare: exercise, diet, smoking, and alcohol consumption, 4. Examination of blood factors and underlying diseases: blood type, vitamin D levels, changes in thyroid hormones, cancer with a history of chemotherapy and psychological stress, and 5. Methods used to control and prevent hair loss

2.5. Statistical analysis:

Statistical analyses were carried out using SPSS V-23.0. Descriptive statistics were applied to determine the frequencies and percentage of distribution of age, gender, marital status, and socio-economic status. And results were written by interpreting the descriptive statistics.

3. Results:

In this paper, we were conducting a survey on 309 people regarding the assessment of the common reasons and treatments they had for their hair loss. The general information about people can be found in (Table 1). The majority (64.8%) of the participants were female, of which 62.5% them notified that they experienced hair loss. Losing hair in the female population was a little more than in the male population in which 58.7% of them notified that they experienced hair loss.

Variables and Classification of	Number (n=309)	Percentage (%)

The variables		
Age		
18-35 years	226	73.1%
36-50 years	68	22.0%
>50 years	15	4.9%
Sexuality		
Male	109	35.2%
Female	200	64.8%
Marital Status		
Unmarried	241	78.0%
Married	68	22.0%
Socio-economic status		
Class I	53	17.1%
Class II	103	33.3%
Class III	80	25.9%
Class IV	73	23.7%

Table 1: General information about the study subjects.

According to the survey, among 189 people who had hair loss, 82% of the participants reported that their first-degree relatives experienced hair loss like them and 18% of the participants reported that their first-degree relatives didn't experience hair loss. The result showed that hair loss in first-degree relatives should be regarded as one of the common reasons.

According to the amount of vitamin D present in the blood test given by people in the past year, 97 people were deficient in vitamin D, and 73.2% of them had hair loss. Out of 309 people, 6.4% of them did not have a blood test in the last year and did not know their vitamin D levels, and 40% of them had hair loss. We also checked the blood type of the people who had hair loss and reached the following results: 25.39% had (A+) blood type, 1.05% had (A-) blood type, 23.28% had (B+) blood type, 3.70% had (B-) blood type, 11.11% had (AB+) blood type, 29.62% had (O+) blood type, 5.85% had (O-) blood type. Also, 10.58% of the surveyed people are (RH-) and 89.42% are (RH+). It appeared that people with (RH+) had a higher incidence of hair loss.

Based on thyroid function tests, it was found that among 25 women with hypothyroidism, 60% had hair loss and 40% did not have hair loss. Also, among the 2 females with hyperthyroidism, both of them had hair loss. Among the 9 males with hypothyroidism, 77.7% had hair loss and 22.3% of them reported no hair loss. Also, out of 3 males who had hyperthyroidism, 66.6% of them had hair loss, and 33.3% of them had no hair loss (Figure 1).
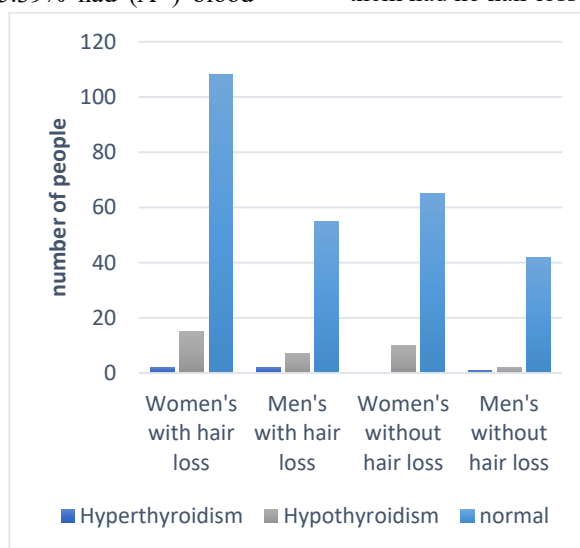

Figure 1: Thyroid problems of the study subjects.

In this project, people rated their stress from 1 to 10 according to their personal opinion. We classified 189 subjects with hair loss into three groups. In the first group, we included people who gave themselves a score of 1-3 (low stress). In the second

group, we included people who gave themselves a score of 4-7 (moderate stress). In the third group, we included people who gave themselves a score of 8 to 10 (high stress). 24 people were in the first group, 58.3% of them were men and 41.6% of them were women. There were 103 people in the second group, 29.1% of them were men and 70.9% of them were women. There were 62 people in the third group, 32.2% of them were men and 67.8% of them were women (Figure 2). Participants with moderate stress levels had a higher incidence of hair loss.
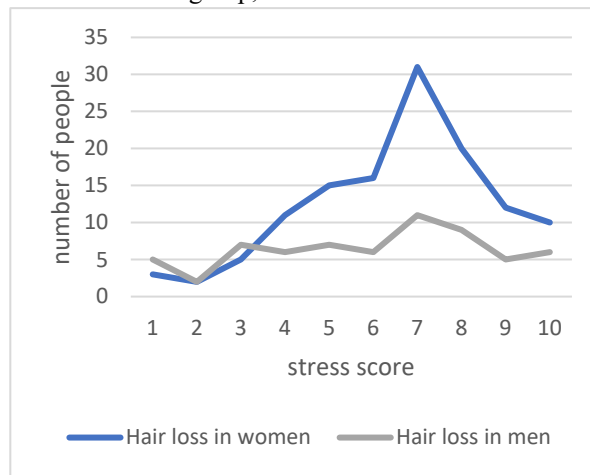

Figure 2: Stress scores of people with hair loss.

Moreover, 78% of the statistical population were smokers. Of these smokers, 52% smoked less than 10 cigarettes per day (first group), 34% smoked between 10 and 20 cigarettes (second group), and 14% smoked more than 20 cigarettes (third group). According to the results, 74% of the first and second groups and 78% of the third group have experienced hair loss. It should be noted that 81% of the people in the first group, 82% of the people in the second group, and 86% of the people in the third group who suffered from hair loss consumed alcohol in addition to smoking (Figure 3)
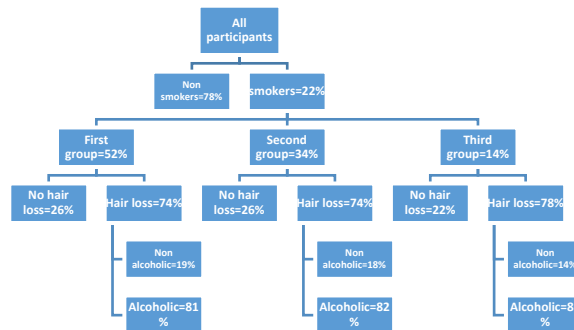

Figure 3: The effect of smoking and alcohol on hair loss.

While questioning the impact of lifestyle on hair loss, out of 189 people who suffered from hair loss, 183 people tried to modify their lifestyle. 107 (58.5%) of the participants mentioned the positive effects of changing their lifestyle on their hair loss, which means that their hair loss decreased compared to before. On the other hand, the remaining 76 people from this category which constitute 41.5% of them, did not notice any particular change in their hair loss process by changing their lifestyle.

We also examined the use of different drugs and their effectiveness or lack of effect on hair loss. Out of 189 people who had hair loss, 83% took medicine. Taking biotin tablets alone has a positive effect of about 80%. Also, the simultaneous use of vitamin D and zinc tablets had a positive effect of 60%. In the simultaneous use of biotin, vitamin D, and zinc, the positive effect of 75.6%. In people who use minoxidil, the positive effect of this pill is about 4 times compared to its lack of effect (Figure 4).
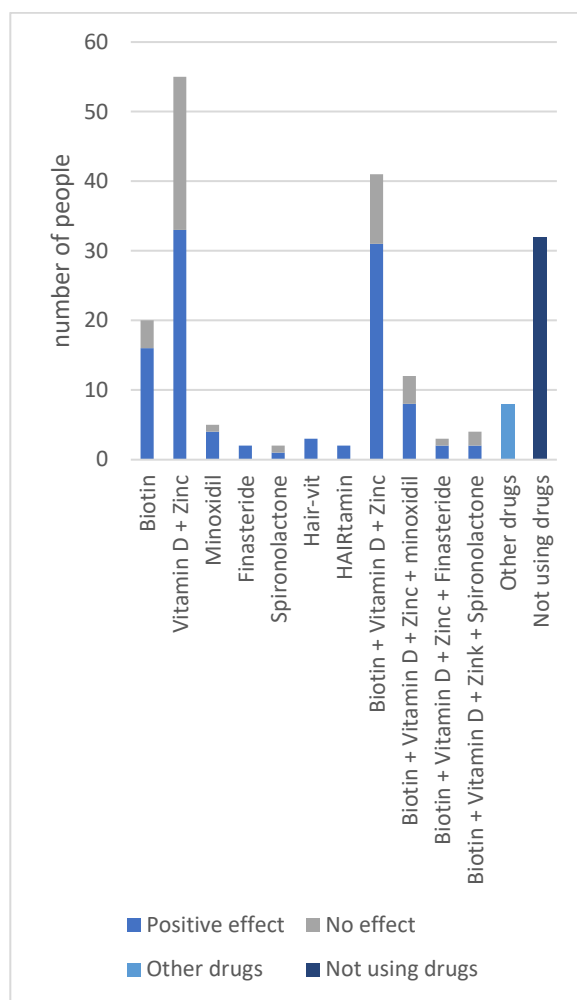
Figure 4: Drugs treatment of the study subjects.

4. Discussion:

In the present study, we explained the common reasons for hair loss and its effects. The impact of gender on losing hair was significant. Experiencing hair loss is predominant in females. However, it can be seen that the effect of treatment on female participants is more than on male participants [23]. As we know, hair loss has various causes, including hereditary causes. These causes are different in men and women. With the investigations that were done, we found out that on average, out of every 10 people who had hair loss, 8 of them had a history of hair loss in their first-degree relatives. According to the research done, the effect of hereditary factors causes more hair loss in men than in women. The changes that occur in the hair follicles usually cause hair loss mostly in the front part of women's heads and some cases cause baldness in men. According to the findings, the cause of this type of hair loss in women can be the same as the cause of baldness in men, both of which are determined due to the existence of a genetic androgen-dependent trait [24]. The rate of hair loss increases with age and we know, there is a direct connection between

hair loss in people and close relatives such as grandparents [25].

If we consider the number of people who have dry scalps as 100, more than half of them have hair loss. Similarly, if we consider the number of people with oily scalps as 100, more than half of them have hair loss. By interpreting this, we can conclude that both dryness and oiliness of the scalp, if it is too much, will increase hair loss. In addition, the extent to which the hair is exposed to external factors such as color or pollution can affect its quality and aggravate hair loss [26].

In general, the results obtained in this research have been expected to an acceptable extent. Hair loss is a common problem and has a profound negative mental and emotional effect on patients. Vitamin D is a fat-soluble vitamin synthesized in epidermal keratinocytes [27]. In our study, it was shown that taking vitamin D along with zinc had a positive effect on preventing hair loss. And more extensive studies on humans are needed to establish the exact role of vitamin D in the hair cycle. Vitamin D has also been used in the treatment of hair loss due to scalp psoriasis [28].

There are four major blood groups determined by the presence or absence of two antigens, A and B, on the surface of red

blood cells. In addition to the A and B antigens, there is a protein called the Rh factor, which can be either present (+) or absent (–), creating the 8 most common blood types (A+, A-, B+, B-, O+, O-, AB+, AB-). In the present research, we observed that 90% of people who had hair loss were Rh+, which is an important point that shows that the presence of Rh protein on red blood cells greatly increases the possibility of hair loss.

Another factor of hair loss that was investigated in this research is the connection between the thyroid gland and hair loss. To examine more closely the relationship between hair loss and thyroid diseases, we must differentiate between types of thyroid problems. Another research inferred that the rate of hair loss in people with thyroid diseases increased by 8-28% [29]. We also observed the same results in our participants who were suffering from hyperthyroidism and hypothyroidism i.e., 64% of people with hypothyroidism and 80% of people with hyperthyroidism had hair loss. So there exists a relationship between thyroid disorders and hair loss So that

We also found out that many factors affect hair loss. Stress, alcohol consumption, and smoking can be considered among these factors. In today's world, everyone experiences stress many times. Fear and worry about many issues such as illness, job or academic problems, family issues, loss of loved ones, troubles and various discomforts have all led to mental stress, and also during our investigations, most of the people who feel Having too much stress and emotional distress cause morbidity to people, and it should be noted that it is one of the most important causes of hair loss in men and women, and in a society where most people are under tension and stress, hair loss will be more prevalent [14,15]. Hair loss is one of the thousands of harms of smoking for humans. Smoking can damage hair follicles and increase the risk of hair loss [14]. It was also found that the more the number of cigarettes a person consumes, the more hair loss he/she has, and the same goes for alcohol consumption. Drinking alcohol in smokers increases the rate of hair loss by over 80%. Consumption of alcohol and smoking, no matter how little, is harmful and it is best to avoid both these drugs.

When the extent of hair loss increases, it first raises concerns about one's appearance and looks. People's lifestyles are influenced by their direct actions in different ways. For example, by continuously dyeing their hair, women expose their hair shafts and roots to damage, which harms hair in the long run, the treatment drugs especially for cancers [30], and tying long hair in a ponytail may seem like a normal thing, but the strands of hair are under tension which leads to the weakening of the root and hair loss [31]. Finding out the main reasons for hair loss cannot always be determined by the amount of hair loss. Even if it seems that people's hair loss is only caused by the wrong lifestyle, they should go to hair loss

treatment centers or their specialist doctor to find out exactly the main causes because there are always differences between the patient's perception of the phenomenon of hair loss and clinical findings, and sometimes neglecting some harmful habits cause indifference to the prevention and treatment of hair loss [32].

There is a wide spectrum of hair loss treatments. In the statistical population that we examined, 17% of people who have hair loss did not use a medicine of which 75% of them were men and 25% of them were women, which shows that women are more important in the treatment of their hair loss than men. Vitamin D deficiency can affect hair loss. The expression of vitamin D receptors is necessary for the strength, integrity, and promotion of the natural hair follicle cycle in the body, and its deficiency leads to problems in the natural hair follicle cycle after birth [33]. Our findings show that taking vitamin D and zinc tablets has positive effects on hair loss. Also, if they are taken together with biotin, their effect on reducing hair loss will increase. The use of biotin alone is more effective than the previous two methods so, in 80% of cases, it has a positive effect on hair loss. Minoxidil is known as one of the effective treatments for hair loss, which leads to an increase in hair diameter and density [34]. According to our findings, in the people who were treated with minoxidil, their hair loss was reduced, so its positive effect was 4 times more than its lack of effect. In some cases, the problem of hair loss is solved by treating the underlying disease of the person. For example, hypothyroid people, in most cases, by taking levothyroxine tablets, in addition to solving the problem of hypothyroidism, their hair loss problem is also solved. In this research, we found that the most effective treatment method for people with hair loss was the use of biotin tablets, which had an 80% positive effect on hair loss. The second effective treatment method was the simultaneous use of biotin, vitamin D, and zinc, which had a 75.6% positive effect on hair loss. According to the good feedback we received from the mentioned treatment methods, it is suggested that if you are suffering from hair loss, try these treatment methods with the advice of your doctor.

4.1. Limitations and recommendations:

To the best of our knowledge, this is the first study in this region. It is an essential contribution to assessing the causes of hair loss and common treatment options used by the participants. Limitations include a modest sample size ($n = 309$) which cannot be generalized to Iranian cultural settings and backgrounds. To establish more accurate results, large-scale and varied samples are needed in future replications of the study. Moreover, this is a descriptive study as it determines only frequencies, and percentages and limits the objectivity of the study. Therefore, the results should be considered only exploratory in the absence of experimental work.

5. Conclusion:

Various factors affect hair loss. The rate of hair loss in women is higher than in men. Hereditary factors are one of the most important causes of hair loss. Vitamin D deficiency affects hair follicles and causes hair loss. People who have blood group RH+ have hair loss much more than people who have blood group Rh-. In today's society, stress has a significant effect on hair loss. People who consume alcohol and cigarettes at the same time have significant hair loss. Lifestyle changes can reduce hair loss. The most effective treatment method in our research is the use of biotin tablets.

Consent

Not required

Registration of research studies

1. Name of the registry: Not applicable
2. Unique Identifying number or registration ID: Not applicable
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): Not applicable

Provenance and peer review

Not commissioned, externally peer-reviewed.

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