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Comparison of Treatment with Oral Vitamin D Alone, Topical Minoxidil or Combination of Both in Patients of Female Pattern Hairloss

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A B S T R A C T

Female pattern hair loss (FPHL) is progressive hair thinning in women, usually distinguished by baldness and reduced hair volume. Symptoms of FPHL include increased shedding, decreased hair density, the development of bald patches, and widening of the central part. Many treatment options include topical minoxidil and oral vitamin D supplementation. The key objective of this study was to compare the treatment of Vitamin D, minoxidil, or the combination of both in female pattern hair loss. This study included 81 female patients from Shaikh Zayed Hospital Dermatology Department, Lahore. Chosen females were allotted to three different groups and received different therapy. Group 1 received combined treatment, including 2% topical minoxidil and oral vitamin D. Group 2 received only 2% topical minoxidil, and Group 3 received vitamin D supplementation alone. Group I combination therapy showed the most significant improvement, with means serum vitamin D levels increasing from 15.4$\pm$9.03 to 191.9$\pm$10.2 ($P<0.001$). Group II (minoxidil alone) and Group II (Vitamin D3 alone) showed modest increases in mean serum vitamin D levels, from 18.27+10.2 and 16.5+13.21 to slightly higher values ($P=0.002$). These findings confirm the combination treatment's superior efficacy for improving hair density and vitamin D levels. These findings demonstrate that combined treatment can be a successful treatment approach. As topical minoxidil helps to counteract the miniaturization of hair follicles, vitamin D prevents the deficiency.

Keywords: Female pattern hair loss, Vitamin D, 2% topical minoxidil, Treatment.

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INTRODUCTION

Nonscarring progressive hair thinning with ongoing hair reduction, especially in frontal, central, and parietal scalp areas, is recognized as female pattern hair loss (FPHL) (Bhat et al., 2020). In the past, female pattern hair loss was thought to be a version of the term “androgenetic alopecia” (AGA), in which hormones and genetics influence the condition, but now it is a bit controversial, and this term is not commonly used today (Sakpuwadol et al., 2023; Ramos and miot, 2015; Tamashunas et al., 2021). In affected areas, there is incomplete primary loss of terminal hair, and the frontal region is usually exempted from significant hair loss compared to the scalp region. Hair cycle changes occurred in different ratios and steps. Follicular miniaturization involves the reduction of the ratio of terminal hair to vellus hair. After this anagen phase shortening, increasing kerogen numbers happen, which results in the apparent change and clinically visible hair thinning (Bhat et al., 2020; Sakpuwadol et al., 2023).

The prevalence of FPHL rises with age. Half of the women will be adversely affected by this during their life. The pattern of hair loss is usually detected by observing history and physical assessment of the face, scalp, and nails. Laboratory tests, hair-pull tests, and dermoscopy can also be employed. For clinically complex cases, a hair biopsy could be beneficial (Egger et al., 2020). Female pattern hair loss is also associated with other diseases like polycystic ovary syndrome, commonly called PCOS, metabolic syndrome, hyperandrogenism, artery diseases, blood pressure, and type II diabetes mellitus (Yaqoob et al., 2021). Females who are suffering from FPHL experience depression and negative body image. They also lose their self-esteem and self-confidence. Women find hair loss more stressful than men (Hassan et al., 2022; Yongpisarn et al., 2024).

Most women with female pattern hair loss do not exhibit clinical or biochemical signs of hyperandrogenism, and their response to anti-androgen therapies tends to be limited. This observation points to the potential involvement of non-androgen-dependent mechanisms in developing FPHL. Recently, serum vitamin D levels have emerged as a factor of interest in evaluating patients with hair loss complaints (Ramos et al., 2023). The potential connection between vitamin D and female pattern hair loss (FPHL) has not been extensively explored. However, recent studies have examined the possible association of vitamin D with various disorders, including androgenetic alopecia, telogen, and areata. Additionally, low levels have been suggested as a potential factor for FPH (Fabbrocini et al., 2018). As a result, measuring serum ferritin levels is often recommended as part of routine evaluations, and dermatologists frequently prescribe iron supplements for women, assuming that low iron stores may be responsible for hair loss. Despite this, evidence remains inconclusive, and conflicting data have yet to support this practice entirely.

Some studies have explored the importance of combining topical minoxidil and oral vitamin D supplements. Due to vitamin D, the efficacy of topical minoxidil increases, and the vitamin itself will contribute to preventing deficiency and hair loss. Recent research showed that women (average age 48) with female-pattern hair loss took this combination for 12 months, increasing hair volume and decreasing hair shedding (Reddy et al., 2022).

In this research, we aim to compare the efficacy of topical minoxidil and oral vitamin D and their combination in the treatment of female pattern hair loss and determine which regime yields the best results.

METHODOLOGY

This prospective randomized, comparative study of 81 patients from the dermatology department at Shaikh Zayed Hospital, from 1st February 2024 to 31st July 2024 in Lahore. The expected effect size (5 for clinically meaningful improvement), $Z\alpha/2$ is 1.96 (for a 5% significance level), and $Z\beta$ is 0.84 (for 80% power). Patients aged 15 to 65, diagnosed with a pattern of hair loss (FPHL), and without topical or systemic treatment for at least 6 months were included. Consent of each patient was taken, and ethical approval was obtained from the Technical & Ethical Review Committee, Shaikh Zayed Federal PGMI, IRB approval number: TERC/SC/INT/2024/539. Pregnant or lactating females, individuals with abnormal blood pressure, and those with medical conditions that could influence the results, like psoriasis, multiple sclerosis, or chronic kidney diseases, were excluded.

The description of the study has been updated to explicitly define it as a randomized controlled trial (RCT). The patients were categorized into three groups, each comprising 27 participants. Group I received a combination of topical 2% minoxidil foam daily and oral vitamin D3 tablets (5000 IU/day) for six months. Group II was treated with topical 2% minoxidil foam alone daily for six months. Group III received only oral vitamin D3 tablets (5000 IU/day) for six months. At the end of the treatment period, vitamin D levels in the patients were re-evaluated.

Patients were randomly assigned to one of the three treatment groups to check the potency of each drug and its combination. These groups include Group 1 (combined treatment): Oral vitamin D supplements and 2% topical minoxidil; Group 2 (alone treatment): Only topical minoxidil 2%; and Group 3 (alone treatment): Only oral vitamin D supplementation.

Data was entered and analyzed in SPSS V 25. Age was presented as mean and SD. Categorical data was presented as frequency and percentage. The chi-square and ANOVA tests were also applied to compare the groups and mean vitamin D levels. P value <0.05 was considered as significant.

RESULTS

81 patients were enrolled and distributed in three treatment groups to check the efficacy of special therapeutic agents and their combination. The mean age of the patients was 32.1 ± 10.2 in Group I, 34.3+12.1 in Group II, and 34.2+11.3 in Group III. Their level of hair loss severity was analyzed by the Sinclair scale. Group 1 received the combined treatment and showed an 85.2% improvement in the thickness and growth of hair. Group 2 applied 2% topical minoxidil on their scalp alone and also showed a substantial improvement of about 77.8%. Patients of group 3 received oral vitamin D alone, which also exhibited 70.4% notable improvement (Figure 1).

Before treatment, in group 1, 3(11.1%) patients were at stage 1, 9 (33.3%%) patients were at stage 2, and 15(55.6%) patients belonged to stage 3. After the treatment 5(18.5%) patient was in stage 1, 18(66.7%) from stage 2 and 4(14.8%) from stage 3. This treatment significantly improved hair thickness and density ($P<0.05$). Vitamin D is important in follicle health and stimulates the topical minoxidil for hair growth.

Before treatment, in groups II and III, 4(14.8%), 2(7.4%) patients were at stage 1, 9 (29.6%), 8(29.6%) patients were at stage 2, 14(55.6%), 17(63%) patients belonged to stage 3. After the treatment 4(14.8%) patient was in stage 1, 17(63%), 15(55.6%)

from stage 2 and 6(22.2%) and 8(19.6%) from stage 3. This treatment also significantly improved hair thickness and density in group II and a slight improvement in group III (P<0.05). Vitamin D is important in follicle health and stimulates the topical minoxidil for hair growth (Table 1).

In group I, the baseline vitamin D mean of 15.44+9.03. In group II, the baseline vitamin D means 18.27+10.2; in group III, the baseline vitamin D means 16.57±13.12. There was no statistical difference between the groups. Vitamin D before and after treatment in each group 1, there was a highly statistically significant improvement in the mean level of vitamin D in group I from 15.44±9.03 to 19.9±10.2 (P<0.001). For groups II and III, there was a statistically significant increase in the mean vitamin D level (0.02) (Table 2).

Table 1. Comparison between the study group with before and after treatment.

	Group I		Group II		Group III		P value
Before	(n=27)	%	(n=27)	%	(n=27)	%	
Stage 1	3	11.1	4	14.8	2	7.4	
Stage II	9	33.3	9	29.6	8	29.6	0.92
Stage III	15	55.6	14	55.6	17	63	
After	27		27		27		
Stage 1	5	18.5	4	14.8	4	14.8	
Stage II	18	66.7	17	63	15	55.6	0.77
Stage III	4	14.8	6	22.2	8	29.6	
Significance between before and after groups	0.007	0.029	0.05				

Table 2. Comparison between studied group with Vitamin D level.

Vitamin D level	Group I	Group II	Group III
Baseline value	15.44+ 9.03	18.27+10.2	16.57+13.12
After treatment value	19.9+10.2	19.2+14.9	19.51+13.6
P value	0.001	0.049	0.02

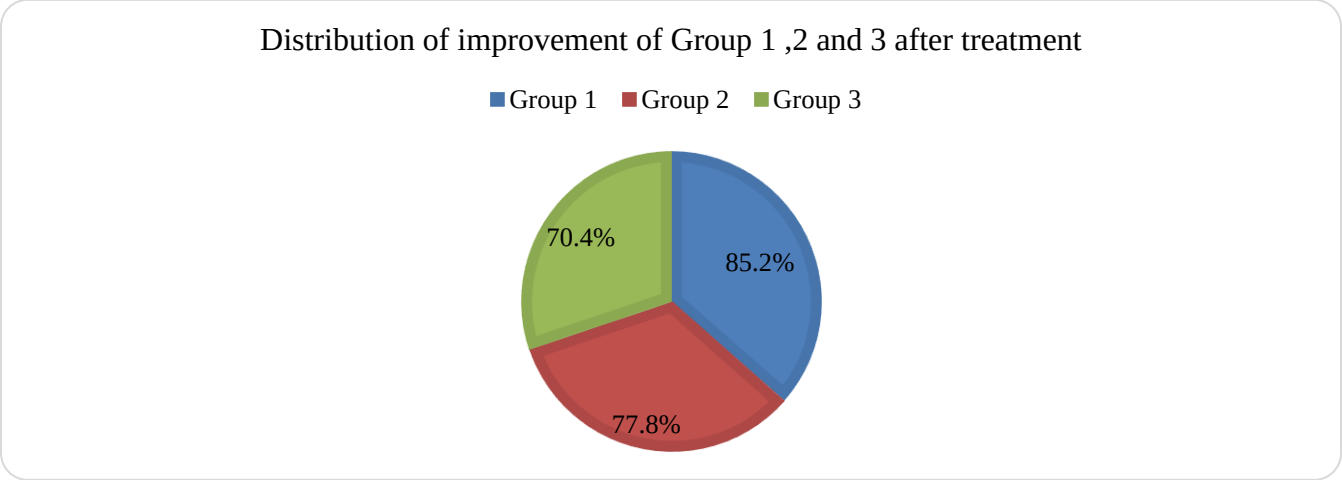

Figure 1. The chart shows degree of enhancement achieved by three groups. Group 1 (combined treatment) shows the highest improvement which is 85.2%, followed by group 2 (2% topical minoxidil) at 77.8%. Group 3 (oral vitamin D) shows 70.4% lower but notable improvement.

DISCUSSION

Female pattern hair loss is the leading cause of diffuse hair thickening in adult women, significantly affecting personal well-being and contributing to various psychosocial challenges. This condition is characterized by the gradual miniaturization of hair follicles, resulting in a progressive reduction in hair thickness and the development of diffuse, non-scarring alopecia.

(Reddy et al., 2022; Banihashemi et al., 2016)**.**

Vitamin D is essential for maintaining various vital functions in the body and has been shown to play a significant role in numerous medical conditions. Studies have demonstrated that topical vitamin D analogs effectively manage psoriasis, highlighting its involvement in skin differentiation and proliferation processes (Hassan et al., 2022). Vitamin D levels are also believed to delay hair loss and aging. This suggests a potential link between vitamin D deficiency and female pattern hair loss (FPHL), necessitating further exploration of its role in hair health and regeneration (Saini and Mysore, 2022)**.**

The study enrolled 81 patients into three treatment groups to evaluate the efficacy of therapeutic approaches for female pattern hair loss. Group I (combination of topical 2% minoxidil foam and oral vitamin D3) showed the most significant improvement, with a notable increase in hair thickness and density ($P<0.05$). Before treatment, 55.6% of patients in Group I were at Stage 3, which reduced to 14.8% after treatment, while the percentage in Stage 2 increased from 33.3% to 66.7%, indicating significant progress. In groups II and III, improvement was also observed, but the response in Group III was less important. Vitamin D levels increased significantly in all groups, with Group I showing the most improvement from 15.44 to 19.55. ($P<0.001$), underscoring the synergistic effect of vitamin D in enhancing the efficacy of topical minoxidil.

Similar results were seen when Hassan et al. conducted research. His findings showed that combining oral vitamin D and 2% topical minoxidil is a better treatment option than topical minoxidil and oral vitamin D alone (Bhatt et al., 2020). In group 2, approximately 74.43% of the patients improved their condition, demonstrating the efficacy of topical minoxidil in hair follicle stimulation. Results of a similar study conducted by Bhat et al.(2020) showed that topical minoxidil can be used as a primary treatment for FPH and is still in use (Bhargava, 2024; van Zuuren et al., 2016; Gerkowicz et al., 2017)**.**

The effectiveness of topical minoxidil for treating female pattern hair loss (FPHL) has been well established, as demonstrated in 2016. A systematic review and meta-analysis of randomization trials conducted by van Burren and colleagues (Ramos et al., 2023). [20] Their findings revealed that women using topical minoxidil (1%, 2%, and 5%) experienced significantly more significant hair regrowth than those in placebo groups. However, the literature also highlights the enhanced efficacy of combination therapies involving agents with different mechanisms of action. This aligns with our findings, which showed that the combination of vitamin D and minoxidil was superior to minoxidil in treating FPHL

A previous study reported significantly lower serum vitamin D levels in patients with FPHL than controls. Although no direct correlation between vitamin D level and FPHL was observed, a significant positive association was found between the severity of hair loss and serum vitamin D concentration (Liu et al., 2021). The authors hypothesized that higher vitamin D levels in severe cases might result from increased ultraviolet light exposure due to reduced scalp hair density, making affected individuals more susceptible to sunlight.

CONCLUSION

The study concluded that vitamin D deficiency was evident in patients with FPHL when compared to all groups. Treatment with vitamin D alone did not produce significant improvement in our findings. However, it was recommended to combine minoxidil with vitamin D to achieve better results than using either drug alone.

AUTHOR'S CONTRIBUTION

All authors contributed to the study's conception, design, and interpretation.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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