EFFICACY OF ORAL MINOXIDIL IN THE TREATMENT OF ANDROGENIC ALOPECIA IN MALE PATIENTS PRESENTING AT A TERTIARY CARE HOSPITAL

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ABSTRACT

OBJECTIVES

This study aimed to determine the efficacy of oral Minoxidil in the treatment of androgenic alopecia among male patients presenting to a tertiary care hospital.

METHODOLOGY

A quasi-experimental study was conducted in the Department of Dermatology, MTI-Hayatabad Medical Complex, Peshawar, from 08 August 2024 to 08 February 2025. Sixty-one male patients aged 18-60 years with androgenic alopecia were enrolled consecutively after ethical approval. Oral Minoxidil 5 mg once daily was administered for four months. Efficacy was defined as ≥1 grade improvement on the Norwood–Hamilton scale after three months of therapy. Data were collected on a structured proforma and analyzed using IBM SPSS version 27. Mean ± SD was calculated for continuous variables and n (%) for categorical variables. Chi-square or Fisher's exact test and logistic regression were applied, with $p<0.05$ considered significant.

RESULTS

The mean age of participants was 40.31 ± 11.98 years, and the mean weight was 74.76 ± 8.34 kg. Mean systolic and diastolic blood pressures were 124.92 ± 13.55 mmHg and 78.25 ± 11.33 mmHg, respectively, and mean heart rate was 78.30 ± 14.43 beats/min. Dyslipidemia was present in 22 (36.1%) patients, and smoking in 25 (41.0%). Oral Minoxidil was effective in 55 (90.2%) patients. Stratified analysis and logistic regression showed no significant association between efficacy and patient characteristics ($p>0.05$ for all).

CONCLUSION

Oral Minoxidil 5 mg once daily is highly effective in improving androgenic alopecia in males, with response remaining consistent across demographic and clinical subgroups.

KEYWORDS: *Androgenic Alopecia, Minoxidil, Alopecia/Drug Therapy, Hair Loss, Norwood-Hamilton Scale*

INTRODUCTION

Androgenic alopecia is a hereditary condition characterized by an exaggerated reaction to androgens and affects around 50% of both males and females.[1] This disorder is marked by a gradual decline in hair growth on the scalp. It usually begins after puberty and follows a characteristic pattern in males. Hair loss is primarily observed on the top and front sides of the head, known as the vertex and frontotemporal regions.[2] In one study of patients with androgenetic alopecia, 26.1% had grade 3, 40.6% had grade 4, 28.7% had grade 5, and 4% had grade 6 alopecia.[3] As the name indicates, androgenic alopecia is strongly influenced by genetic factors and androgen activity. The condition follows a polygenic inheritance pattern, with contributions from both maternal and paternal genes.[4] The likelihood of baldness is higher in individuals with a family history of the condition. Pattern alopecia occurs when androgen receptors are activated, typically after puberty. Individuals with androgen insensitivity syndrome or those castrated before puberty do not develop pattern baldness.[5,6] The development of androgenic alopecia is closely related to hormonal metabolism and androgen receptor activity. Activation of androgen receptors shortens the anagen phase of the normal hair cycle. As a result, the growth phase becomes progressively shorter. This process leads to follicular miniaturization. Hair follicles gradually decrease in size and length and may eventually lose their ability to penetrate the outer layer of the skin.[7,8] Oral Minoxidil has emerged as an effective therapeutic option for androgenetic alopecia. It helps reduce hair loss progression and promotes hair regrowth.[9] Minoxidil was originally developed as an antihypertensive drug. Later, it gained attention for its

unexpected side effect: hair growth. Although topical formulations are widely used, oral Minoxidil has recently attracted interest due to its potential systemic effects on hair follicles.[10,11] A study reported an efficacy of 90.2% of oral Minoxidil in male patients with androgenetic alopecia.[12] Androgenic alopecia is one of the most common causes of hair loss in men. However, local literature on its treatment remains limited. Therefore, this study was conducted to determine the efficacy of oral Minoxidil in male patients presenting with androgenic alopecia at our health care setup. The findings of this study will help clinicians better understand the benefits and potential risks of oral Minoxidil. This may support informed decision-making and improve personalized management of hair loss.

METHODOLOGY

This quasi-experimental study was conducted at the Department of Dermatology, MTI-Hayatabad Medical Complex, Peshawar, after obtaining approval from the Institutional Review and Ethical Board (Approval No. 1861) and the Research Evaluation Unit of the College of Physicians and Surgeons, Pakistan. Data collection commenced after ethical approval and continued for six months from 08 August, 2024 to 08 February, 2025. A total of 61 male patients aged 18-60 years presenting with androgenic alopecia were enrolled consecutively. The sample size of 61 was calculated using the WHO sample size calculator, assuming an efficacy of oral Minoxidil of 90.2%, a confidence level of 95%, and a margin of error of 7.5%. Male patients aged 18-60 years with androgenic alopecia were included, whereas those with heart failure, medication-induced hair loss, thyroid disorders, or cicatricial alopecia were excluded. Androgenic alopecia was defined as progressive hair thinning over the frontal or parietal scalp, with relatively preserved occipital hair density, retention of the frontal hairline, and the presence of miniaturized hairs. Oral Minoxidil was administered at a dose of 5 mg once daily for four months. Efficacy was defined as improvement of at least one grade on the Norwood-Hamilton scale after 3 months of treatment, as assessed by physical examination. Patients fulfilling the inclusion criteria were enrolled consecutively after written informed consent, and the purpose and benefits of the study were explained. A predesigned proforma was used to record demographic details (age, weight, educational and occupational status, socioeconomic status, and residence), medical history (diabetes, hypertension, dyslipidemia, and smoking status), and baseline cardiovascular parameters (systolic and diastolic blood pressure and heart rate). All participants received oral Minoxidil 5 mg once daily for four months under dermatological supervision, and hair growth response was assessed at baseline and after three months using the Norwood-Hamilton scale. Statistical analysis was performed using IBM SPSS Statistics version 27.0. For numerical variables such as age, weight, systolic and diastolic blood pressure, and heart rate, the mean ± standard deviation or the median (interquartile range) was calculated depending on the data distribution. Normality was assessed using the Shapiro-Wilk test. Frequencies and percentages were calculated for categorical variables, including efficacy, dyslipidemia, smoking, educational status, occupation, and socioeconomic status. Efficacy was stratified by age, weight, heart rate, blood pressure, dyslipidemia, smoking status, educational status, occupation, and socioeconomic status to control for potential effect modifiers. Post-stratification, the Chi-square or Fisher's exact test was applied where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 61 male patients with androgenic alopecia were enrolled. The mean age was 40.31 ± 11.98 years, and the mean weight was 74.76 ± 8.34 kg. The mean systolic and diastolic blood pressures were 124.92 ± 13.55 mmHg and 78.25 ± 11.33 mmHg, respectively, while the mean heart rate was 78.30 ± 14.43 beats/min.

Table 1: Baseline Characteristics of Study Participants (n = 61)

Categorical Variables	Category	Frequency (n)	%age
Dyslipidemia	Yes	22	36.1
	No	39	63.9
Smoking	Yes	25	41.0
	No	36	59.0
Education Status	Educated	52	85.2
	Uneducated	09	14.8
Occupation Status	Employed	40	65.6
	Unemployed	21	34.4
Socioeconomic Status	Lower	22	36.1
	Middle	32	52.5
	Upper	07	11.5
Efficacy of Oral Minoxidil	Yes	55	90.2

Table 2: Efficacy of Oral Minoxidil by Patient Characteristics (n = 61)

Characteristic	Subcategory	Efficacy		Total n (%)	p-value
		Yes n (%)	No n (%)		
Dyslipidemia	Yes	20 (90.9)	02 (9.1)	22 (100.0)	>0.99
	No	35 (89.7)	04 (10.3)	39 (100.0)	
Smoking	Yes	23 (92.0)	02 (8.0)	25 (100.0)	>0.99
	No	32 (88.9)	04 (11.1)	36 (100.0)	
Education Status	Educated	48 (92.3)	04 (7.7)	52 (100.0)	0.212
	Uneducated	07 (77.8)	02 (22.2)	9 (100.0)	
Occupation Status	Employed	36 (90.0)	04 (10.0)	40 (100.0)	>0.99
	Unemployed	19 (90.5)	02 (9.5)	21 (100.0)	
Socioeconomic Status	Lower	21 (95.5)	01 (4.5)	22 (100.0)	0.176
	Middle	29 (90.6)	03 (9.4)	32 (100.0)	
	Upper	05 (71.4)	02 (28.6)	07 (100.0)	

Table 3: Logistic Regression of Factors Associated with Efficacy of Minoxidil (n = 61)

Variable	Category (Reference)	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Dyslipidemia	Yes vs No	1.13	0.22 – 5.82	>0.99
Smoking	Yes vs No	1.32	0.22 – 7.76	>0.99
Education Status	Educated vs Uneducated	4.66	0.60 – 36.3	0.212
Occupation Status	Employed vs Unemployed	1.06	0.18 – 6.08	>0.99
Socioeconomic Status	Middle vs Lower	0.61	0.07 – 5.31	0.176
	Upper vs Lower	0.12	0.01 – 1.65	

DISCUSSION

In this study, oral Minoxidil 5 mg once daily demonstrated a high efficacy rate (90.2%) in improving Androgenic alopecia in male patients, consistent with previously reported results with low-dose oral minoxidil regimens.[13] This high response underscores the potential of oral Minoxidil as a viable therapeutic option, complementing or potentially substituting topical formulations in cases of low compliance or scalp intolerance. Comparative evidence suggests that while oral and topical Minoxidil may yield similar improvements in hair density over time, oral formulations offer advantages in ease of administration and adherence. A randomized trial comparing oral (5 mg/day) versus topical (5%) Minoxidil observed comparable improvements in terminal and total hair density over 24 weeks, although oral treatment was associated with more hypertrichosis and some systemic side effects.[14] Similarly, a recent meta-analysis of multiple studies confirmed the favorable tolerability of oral Minoxidil, with adverse effects largely mild and manageable.[15] Our stratified analysis revealed no statistically significant differences in efficacy across subgroups defined by dyslipidemia, smoking status, education, occupation, or socioeconomic status, indicating that oral Minoxidil's effect is largely consistent across these demographic and clinical strata. This uniformity is clinically reassuring, suggesting that baseline comorbidities may not significantly alter response in men with AGA. Safety remains a key consideration for systemic therapy. Low-dose oral Minoxidil has been generally well tolerated in the dermatologic literature.[16] In large series, hypertrichosis is the most frequent adverse effect, while cardiovascular events, such as hypotension or tachycardia, are rare in otherwise healthy individuals.[17] One safety study involving over 1,400 patients reported hypertrichosis in ~15 % of patients, with treatment discontinuation in <1 %.[18] In our study, no serious cardiovascular events or hypotension necessitating withdrawal were observed, though we acknowledge our sample size limits detection of rare events. Mechanistically, Minoxidil acts as a potassium channel opener and vasodilator, increasing capillary blood flow and promoting the anagen phase of hair follicles.[19] Dose-dependent responses have been noted, with some evidence that higher low-dose regimens yield greater hair growth but also increased risk of side effects.[20] This balance between efficacy and safety may guide optimal dosing in future studies. In this study, oral Minoxidil 5 mg once daily demonstrated high efficacy (90.2%) in male androgenic alopecia, with no significant differences across demographic or clinical variables. Logistic regression analysis revealed that dyslipidemia, smoking, education, occupation, and socioeconomic status were not significant predictors of response, suggesting a consistent therapeutic effect across patient subgroups. These findings are consistent with previous reports showing that oral Minoxidil is effective and safe regardless of comorbidities or lifestyle factors.[8] The uniform efficacy may be explained by its localized action on hair follicles through potassium channel activation and stimulation of vascular endothelial growth factor (VEGF), mechanisms largely independent of systemic conditions.[9] Overall, this study supports prior evidence that low-dose oral Minoxidil provides reliable and uniform therapeutic outcomes in male Androgenic alopecia.[14] The slightly higher, though non-significant, odds of response among educated participants could be attributed to better treatment adherence and understanding of therapy, a pattern commonly observed in chronic dermatological treatments.

LIMITATIONS

The quasi-experimental (non-randomized) design, single-centre setting, and relatively small sample size, which may limit generalizability and the power to detect subgroup differences or rare adverse events. Moreover, our follow-up period (three months to assess efficacy) is shorter than many longer-term trials; sustained response and long-term safety require further study.

CONCLUSIONS

Oral Minoxidil at a dose of 5 mg once daily demonstrated high efficacy, with 90% of male patients with Androgenic alopecia achieving at least a 1-grade improvement on the Norwood-Hamilton scale after 3 months of treatment. The response was consistent across different demographic and clinical subgroups, and no serious adverse events were observed during the study period. These findings support the use of low-dose oral Minoxidil as an effective and well-tolerated therapeutic option for male Androgenic alopecia in our local population. Larger randomized studies with longer follow-up are recommended to confirm long-term safety and comparative effectiveness. Oral minoxidil efficacy showed no significant association with demographic or clinical variables. The treatment demonstrated a uniform therapeutic response across all patient subgroups.

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The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.