Research Article

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Effectiveness of 1% Topical Spironolactone in the Management of Androgenetic Alopecia

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Abstract

Androgenetic alopecia (AGA) is a common progressive, nonscarring form of hair loss associated with follicular miniaturization and considerable psychosocial burden. Topical spironolactone is an investigational antiandrogenic approach, but clinical evidence for the 1% formulation remains limited. This study aimed to describe changes in trichoscopic hair-count measures and reported tolerability after 16 weeks of once-daily application of 1% topical spironolactone in patients with AGA. This single-centre descriptive case series included 60 adults aged 18–55 years with clinically diagnosed AGA who attended the Dermatology outpatient department at Lahore Medical and Dental College, Ghurki Trust Teaching Hospital, Lahore, between March and July 2026. All participants applied 1% topical spironolactone once daily to the affected scalp areas for 16 weeks. Trichoscopic findings were recorded at baseline and at week 16. The mean age was 32.12 $\pm$ 8.30 years, and 33 participants (55.0%) were male. Mean thin terminal-hair counts increased from 12.73 $\pm$ 3.24 to 15.63 $\pm$ 5.49, thick terminal-hair counts increased from 17.55 $\pm$ 6.88 to 22.78 $\pm$ 13.47, total terminal-hair counts increased from 30.28 $\pm$ 8.79 to 39.15 $\pm$ 17.58, and total hair counts increased from 41.95 $\pm$ 11.40 to 48.33 $\pm$ 17.42. Mean vellus-hair counts decreased from 11.68 $\pm$ 4.14 to 9.18 $\pm$ 3.50. The manuscript reports $p < 0.001$ for these comparisons, although the paired statistical test outputs were unavailable for independent verification. Overall, 42 participants (70.0%) were classified as having an effective treatment response, although the original response criterion requires further clarification. No adverse effects were reported by 50 participants (83.3%), while pruritus was reported by six participants (10.0%) and scalp dryness or peeling by four participants (6.7%). These findings indicate that 16 weeks of treatment with 1% topical spironolactone was associated with favorable within-participant changes in trichoscopic hair-count measures and generally acceptable local tolerability. However, given the absence of a control group and unresolved discrepancies among certain tabulated measurements, the findings should be considered preliminary and cannot establish comparative treatment efficacy or systemic safety.

Keywords: androgenetic alopecia, topical spironolactone, trichoscopy, hair count, terminal hair, vellus hair, observational study

1. INTRODUCTION

Androgenetic alopecia (AGA) is a common, chronic, nonscarring disorder of scalp hair characterized by progressive follicular miniaturization and a recognizable pattern of hair thinning. In genetically susceptible individuals, androgen signaling contributes to shortening of the anagen phase and progressive production of finer, shorter hair shafts. Men commonly exhibit frontotemporal recession and vertex thinning, whereas women more often present with diffuse reduction in hair volume over the central scalp and preservation of the frontal hairline. Although AGA is not life-threatening, its visible and persistent nature can negatively affect psychological well-being, body image, interpersonal confidence, and quality of life [1–3]. The burden of disease and the duration of treatment required make tolerability, accessibility, and adherence important considerations when evaluating emerging treatment strategies.

The pathophysiology of AGA involves the interaction of inherited susceptibility, local follicular responses to androgens, and changes in the hair-growth cycle. Genetic research has identified androgen-receptor pathways and multiple susceptibility loci, but these findings do not imply that a single genetic marker can adequately predict the clinical course or treatment response of an individual patient [3, 4]. Estimates of prevalence vary considerably with age, sex, ethnicity, and the clinical definitions used, and should not be applied to all populations without qualification [1, 6]. Earlier recognition is clinically valuable because advanced miniaturization may reduce the visible potential for subsequent improvement. Physical examination and standardized clinical grading remain fundamental, while trichoscopy provides a practical, noninvasive way to document hair-shaft diameter diversity, increased numbers of miniaturized hairs, peripilar changes, yellow dots, and the composition of follicular units [7].

Treatment seeks to slow progression, preserve functioning follicles, and improve the appearance and density of scalp hair. Topical minoxidil and, in appropriate male patients, oral finasteride remain established treatment options in relevant regulatory settings; choice of therapy depends on sex, age, contraindications, anticipated adherence, patient preference, and the balance of benefits and harms [5, 6, 8, 13]. Long-term treatment is often necessary to maintain a clinical response. Consequently, there is continuing interest in additional pharmacological approaches for patients who experience inadequate benefit, unwanted effects, or practical difficulties with conventional treatment. Emerging alternatives should nevertheless be judged against the quality of their supporting trials rather than on a presumed advantage arising from a different mechanism of action.

Spironolactone is a mineralocorticoid-receptor antagonist with antiandrogenic properties, including antagonism of androgen receptors and effects on androgen-related pathways. Oral spironolactone has been used off-label, particularly in selected women with female-pattern hair loss; however, its use may be limited by contraindications, systemic adverse effects, reproductive considerations, and monitoring needs [9, 10, 18]. A topical formulation could provide local exposure to the scalp while potentially reducing systemic exposure. This rationale is biologically plausible, but topical application cannot, by itself, establish an absence of systemic absorption or clinically significant adverse effects. Evidence from topical lipid-carrier formulations developed for acne illustrates formulation possibilities, not proof of equivalent delivery or efficacy in scalp hair follicles [11]. A systematic review of oral and topical spironolactone emphasized promising findings alongside the small and heterogeneous evidence base and the need for more rigorous randomized studies [2].

Several studies have examined topical spironolactone in AGA using different formulations, concentrations, and follow-up periods. Yousef et al. compared topical finasteride with topical spironolactone, while Abdel-Raouf et al. evaluated topical 1% spironolactone gel alone and in combination with minoxidil, with clinical and histopathological outcomes [12, 16]. Hussein et al. reported a dermoscopic evaluation of once-daily topical 1% spironolactone in 26 patients followed for at least six months, with differing patterns of change between male and female participants [14]. Ammar et al. assessed topical 5% spironolactone, 5% minoxidil, and their combination in a comparative study involving both sexes [15]. More recently, Hassan et al. compared topical spironolactone with topical minoxidil in female-pattern hair loss [17]. These reports are clinically relevant, but findings should not be assumed interchangeable because formulation, dosing, treatment duration, patient characteristics, control conditions, and outcome measurement differ between studies.

In particular, further descriptive evidence is needed on the short-term changes observed with a once-daily 1% preparation in local clinical practice. At the same time, an uncontrolled series cannot determine how much change arises from the intervention rather than measurement variability, natural temporal fluctuation, co-interventions, or regression to the mean. The present study therefore aimed to describe baseline-to-week-16 changes in trichoscopic terminal and vellus-hair counts among adults with AGA treated with once-daily 1% topical spironolactone at a Lahore tertiary-care dermatology service. Secondary descriptive objectives were to report the authors' treatment-response classifications, recorded local adverse events, and exploratory differences by selected demographic and disease-history characteristics. Its purpose was to generate clinically relevant observations and hypotheses for subsequent controlled research, not to establish comparative efficacy or long-term safety.

2. METHODOLOGY

2.1. STUDY DESIGN, SETTING, AND ELIGIBILITY

The study was reported as a single-centre, descriptive, prospective case series conducted in the outpatient Department of Dermatology, Lahore Medical and Dental College, Ghurki Trust Teaching Hospital, Lahore, Pakistan, between March and July 2026. A total of 60 participants were recruited through non-probability purposive sampling. The source manuscript described a 95% confidence level and an 11% margin of error in connection with sample-size estimation; however, it did not identify the assumed response proportion, the exact calculation formula, or a sample-size software output. These details should be obtained from the original protocol before a reproducible sample-size justification can be reported.

Eligible participants were women or men aged 18–55 years with clinically diagnosed AGA, meeting the investigators' stated operational criteria and reporting no AGA treatment during the preceding three months. Patients were excluded when they had other systemic diseases considered to cause hair loss, a history of reproductive or sexual dysfunction under the original protocol, pregnancy or lactation, or loss to follow-up. Since the exclusion criteria and screening process were not supplied in full, their operational implementation and the number excluded at each stage require confirmation. The reported final sample comprised 33 men and 27 women.

2.2. INTERVENTION AND FOLLOW-UP

After institutional review-board approval, eligible participants received an explanation of the study objectives, planned treatment, assessment procedures, and foreseeable adverse events. Written informed consent was obtained before inclusion. All enrolled participants were prescribed 1% topical spironolactone for once-daily application to the affected scalp for 16 weeks. The concentration and frequency were reported, but the formulation vehicle, volume per application, extent of scalp coverage, dispensing method, adherence monitoring, and management of concomitant products were not specified in the original report. These are clinically important reproducibility details and should be documented from study records rather than inferred.

Trichoscopic evaluations were scheduled at baseline and at the end of 16 weeks. The investigators used a HEINE DELTA 30 handheld dermoscope at a reported magnification of $10\times$; images were also acquired using an iPhone 12 camera at a reported additional magnification of $3\times$. A predefined proforma was used to record thin and thick terminal hairs, total terminal hairs, vellus hairs, total hairs, disease characteristics, and adverse events. The manuscript did not identify a fixed scalp sampling area, the method for relocating the same site, whether image assessments were blinded, or the operational threshold for a responder. Accordingly, the hair values are described as reported hair *counts* rather than counts per square centimetre or proven changes in hair density.

2.3. OUTCOMES AND STATISTICAL ANALYSIS

The principal outcomes were reported within-participant changes between baseline and week 16 in thin terminal-hair count, thick terminal-hair count, total terminal-hair count, vellus-hair count, and total hair count. Secondary descriptive outcomes comprised the binary classification of treatment effectiveness, photographic-assessment categories, local adverse events, and exploratory associations with age, sex, marital status, duration of AGA, prior therapy, and family history. The manuscript describes statistical analysis using IBM SPSS Statistics version 26.0, with numerical variables summarized by means and standard deviations and categorical variables by counts and percentages.

The source also reports chi-square or Fisher's exact tests for stratified comparisons and statistical significance at $p \leq 0.05$. It does not specify which paired-sample test generated the pre/post trichoscopic p-values, whether distributional assumptions were checked, how missing observations were handled, or whether corrections for multiple comparisons were performed. Accordingly, reported significance values are retained as author-reported results, without asserting independent statistical verification. For descriptive tables, percentages that can be unequivocally derived from the stated integer counts and the denominator of 60 have been arithmetically corrected. Where counts themselves conflict between tables, the conflicting source values are retained and explicitly flagged for reconciliation with patient records.

3. RESULTS

3.1. PARTICIPANT CHARACTERISTICS

Sixty patients were included in the reported analysis. Their mean age was 32.12 ± 8.30 years (range 18–50 years), and 33 (55.0%) were male while 27 (45.0%) were female. Table 1 describes the baseline demographic and clinical characteristics. On the basis of its stated counts, 37 participants (61.7%) were married and 23 (38.3%) were unmarried. Twenty-one (35.0%) reported AGA for less than one year, 29 (48.3%) for one to five years, and ten (16.7%) for more than five years. Fourteen (23.3%) had previously received AGA treatment, while 46 (76.7%) had not; all participants

were reported to have been treatment-free during the three months before enrolment. A family history was reported by 50 (83.3%). Sinclair grades I–III account for the 27 female participants, and the listed Hamilton grades account for the 33 male participants. These descriptive distributions should be understood as characteristics of the enrolled series, rather than population-based estimates of AGA prevalence or hereditary risk.

Table 1. *Demographic & clinical characteristics of patients (n = 60)*

Variable	Frequency(%)	Mean±SD
Age (years)		32.12 ±8.3 (18-50)
Gender		
Male	33 (55.0)	
Female	27 (45.0)	
Marital Status		
Married	37(61.7)	
Unmarried	23 (38.3)	
Duration of Disease		
Duration < 1 year	21(35.0)	
Duration 1–5 years	29 (48.3)	
Duration > 5 years	10 (16.7)	
Prior treatment		
Yes	14 (23.3)	
No	46 (76.7)	
Family history		
Yes	50 (83.3)	
No	10 (16.7)	
Sinclair Score		
I	12(20.0)	
II	9(15.0)	
III	6(10.0)	
Hamilton Score		
I	6(10.0)	
II	9(15.0)	
III	6(10.0)	
IV	6(10.0)	
V	6(10.0)	

3.2. CHANGE IN TRICHOSCOPIC HAIR COUNTS

Table 2 compares the authors' baseline and week-16 mean counts. Thin terminal hairs increased from 12.73 ± 3.24 to 15.63 ± 5.49, and thick terminal hairs increased from 17.55 ± 6.88 to 22.78 ± 13.47. Reported total terminal-hair counts rose from 30.28 ± 8.79 to 39.15 ± 17.58, whereas total hair counts rose from 41.95 ± 11.40 to 48.33 ± 17.42. Mean vellus-hair counts declined from 11.68 ± 4.14 to 9.18 ± 3.50. All five comparisons were reported as statistically significant at $p < 0.001$. Because the original paired observations and paired-test output were not supplied, the reported significance levels could not be independently reproduced. Moreover, the week-16 total terminal-hair mean does not equal the sum of the separate thin- and thick-terminal means, indicating a discrepancy that requires verification against the underlying assessment sheets.

Table 2. *Trichoscopic findings before & after treatment (n = 60)*

Variable	Baseline Mean ± SD	16 Weeks Mean ± SD	Mean Difference	P-value
Terminal Thin Hair	12.73 ± 3.24	15.63 ± 5.49	+2.90	<0.001
Terminal Thick Hair	17.55 ± 6.88	22.78 ± 13.47	+5.23	<0.001
Total Terminal Hair	30.28 ± 8.79	39.15 ± 17.58	+8.87	<0.001
Vellus Hair	11.68 ± 4.14	9.18 ± 3.50	-2.50	<0.001
Total Hair Count	41.95 ± 11.40	48.33 ± 17.42	+6.38	<0.001

Note: Means and standard deviations are author-reported; differences are calculated from the displayed means. The original paired-test outputs and discrepancies in component versus total counts require author verification.

3.3. REPORTED RESPONSE CLASSIFICATION AND TOLERABILITY

A favorable treatment response was assigned to 42 of 60 participants (70.0%), with 18 participants (30.0%) classified as not responding. Figure 1 illustrates the reported response distribution. This classification cannot be equated with a validated efficacy endpoint until the threshold used to distinguish an effective from an ineffective response is supplied. The separately reported photographic assessment classified six patients (10.0%) as showing excellent improvement, 15 (25.0%) as moderate, 18 (30.0%) as mild, and 21 (35.0%) as unchanged. Thus, the combined photographic improvement categories account for 39 patients (65.0%), rather than the 42 patients classified as effective; these are distinct reported measures requiring clarification of their definitions.

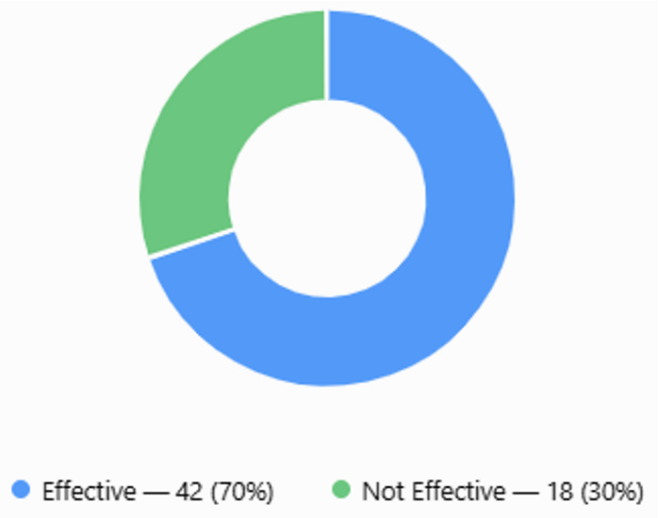

Figure 1. *Reported treatment-response classification after 16 weeks (42 classified as effective and 18 as not effective; chart reconstructed from the manuscript counts).*

Table 3 summarizes the recorded trichoscopic features, local tolerability findings, and photographic categories. Hair-shaft diameter diversity and the presence of vellus hairs were reported in all 60 participants; yellow dots and empty ostia were observed in 54 (90.0%) and 51 (85.0%), respectively, while the peripilar sign was present in 42 (70.0%). Fifty participants (83.3%) had no recorded adverse effects, six (10.0%) reported pruritus, and four (6.7%) reported dryness or peeling during follow-up. These categories sum to 60, but the manuscript does not state how adverse effects were ascertained, whether they were solicited systematically, or whether laboratory safety parameters were measured. Thus, the findings describe reported local tolerability and do not establish the absence of systemic effects.

Table 3. *Trichoscopic features, side effects, and photographic assessment (n = 60)*

Variable	Category	Frequency (n)	Percentage (%)
Diameter diversity	Yes	60	100.0
	No	0	0.0
Peripilar sign	Yes	42	70.0
	No	18	30.0
Yellow dots	Yes	54	90.0
	No	6	10.0
Vellus hair	Yes	60	100.0
	No	0	0.0
Empty ostia	Yes	51	85.0
	No	9	15.0
Side effects	None	50	83.3
	Pruritis	6	10.0
	Dryness/Peeling	4	6.7
Photographic assessment	Excellent improvement	6	10.0
	Moderate improvement	15	25.0
	Mild improvement	18	30.0
	No change	21	35.0

3.4. EXPLORATORY STRATIFIED RESPONSE ANALYSES

Table 4 presents the author-reported distribution of response classifications by participant characteristics. Of the 24 patients aged 18–30 years, 18 (75.0%) were classified as responders, compared with 17 of 26 (65.4%) aged 31–40 years and seven of ten (70.0%) older than 40 years. Male patients had a reported response proportion of 25/33 (75.8%) and female patients of 17/27 (63.0%), without a statistically significant association with sex ($p = 0.282$). Response proportions differed across disease-duration groups (17/21, 15/29, and 10/10; author-reported $p = 0.006$). The ten of ten responses in the longest-duration category involve a small subgroup and should not be taken as proof that longer-standing disease predicts superior benefit.

The marital-status subgroup counts in Table 4 (33 married and 27 unmarried) conflict with the baseline counts in Table 1 (37 married and 23 unmarried). The source data do not permit a defensible choice between these counts. The discrepancy remains visible for author reconciliation before any marital-status association is interpreted.

Table 4. *Effectiveness and stratified analysis by different predictors (n = 60)*

Variable	Category	Frequency (%)	Not Effective n (%)	Effective n (%)	P-value
Age group (years)	18–30	24 (40.0)	6 (25.0)	18 (75.0)	0.760
	31–40	26 (43.3)	9 (34.6)	17 (65.4)	
	>40	10 (16.7)	3 (30.0)	7 (70.0)	
Sex	Male	33 (55.0)	8 (24.2)	25 (75.8)	0.282
	Female	27 (45.0)	10 (37.0)	17 (63.0)	
Marital status	Married	33 (55.0)	10 (30.3)	23 (69.7)	0.955
	Unmarried	27 (45.0)	8 (29.6)	19 (70.4)	
Duration of disease	<1 year	21 (35.0)	4 (19.0)	17 (81.0)	0.006*
	1–5 years	29 (48.3)	14 (48.3)	15 (51.7)	
	>5 years	10 (16.7)	0 (0.0)	10 (100.0)	
Prior treatment	Yes	14 (23.3)	2 (14.3)	12 (85.7)	0.143
	No	46 (76.7)	16 (34.8)	30 (65.2)	
Family history	Yes	50 (83.3)	15 (30.0)	35 (70.0)	1.000
	No	10 (16.7)	3 (30.0)	7 (70.0)	

Note: Marital-status counts conflict with Table 1 and require source-record reconciliation. Reported *p*-values are not independently validated. Percentage labels within a characteristic use the characteristic's category as denominator unless otherwise stated.

3.5. SEX-SPECIFIC TRICHOSCOPIC SUMMARIES

Table 5 reproduces the reported sex-specific ranges, means, standard deviations, and statistical comparisons. Female participants had a reported mean total terminal-hair count of 36.89 ± 7.86 at baseline and 52.56 ± 14.88 at week 16; the corresponding male means were 24.82 ± 4.71 and 28.91 ± 7.01. Changes in other terminal- and vellus-hair categories are displayed separately. Although the within-sex comparisons were reported as significant, these data should not be used to claim a statistically established difference in treatment response between the sexes, because no appropriate between-sex comparison of change scores was provided. In addition, several component sums and sex-weighted totals do not reconcile with Table 2. All published numeric results have therefore been retained for verification rather than adjusted through speculative reconstruction.

Table 5. *The effect of treatment with topical spironolactone on thin, thick, vellus, terminal and total hair in patients with androgenetic alopecia (n = 60)*

Parameter	Treatment	Min	Max	Mean±S.D.	P value
Terminal (total)	Before	F:24 M:16	F:45 M:29	F:36.89±7.86 M:24.82±4.71	F:0.001
	After	F:36 M:16	F:82 M:42	F:52.56±14.88 M:28.91±7.01	M:0.006
Thick (terminal)	Before	F:13 M:9	F:31 M:15	F:23.22±5.97 M:12.91±2.05	F:0.001
	After	F:14M:9	F:56 M:18	F:33.11±11.98 M:14.45±2.77	M:0.021
Thin (terminal)	Before	F:11 M:7	F:19 M:14	F:14.67±3.19 M:11.91±2.44	F:0.002
	After	F:12 M:7	F:26 M:17	F:19.44±4.76 M:13.91±2.98	M:0.006
Vellus	Before	F:7 M:5	F:18 M:15	F:14.67±3.81 M:9.23±3.84	F:0.001
	After	F:6M:4	F:15 M:15	F:10.78±3.44 M:7.82±3.55	M:0.019
Total Hair Count	Before	F:31 M:30	F:59 M:38	F:51.56±9.22 M:34.05±2.86	F:<0.001
	After	F:42 M:30	F:88 M:42	F:60.89±14.72 M:35.82±3.05	M:0.003

Note: F = female (n = 27); M = male (n = 33). These values are transcribed from the supplied manuscript. Some component counts and weighted totals are inconsistent with Table 2; the authors must review the original trichoscopic records and paired analyses.

4. DISCUSSION

The present single-centre series describes trichoscopic changes following 16 weeks of once-daily 1% topical spironolactone in adults with AGA. The reported mean counts of thin terminal hairs, thick terminal hairs, and total hairs increased, while mean vellus-hair counts decreased. A reported response classification of 42/60 participants (70.0%) and the predominance of no recorded local adverse effects provide additional descriptive information. These observations are potentially encouraging, but the one-group before-and-after design cannot distinguish a drug effect from other explanations for change, and several internal inconsistencies in the displayed counts should be resolved before definitive statistical interpretation.

There is a plausible pharmacological rationale for investigating spironolactone in AGA: antiandrogenic activity may be relevant to follicular miniaturization in susceptible individuals [1, 2, 9]. Oral use in female-pattern hair loss has provided some clinical experience, but oral and topical administration differ in systemic exposure, formulation, monitoring needs, and potentially in clinical effectiveness [10, 18]. Neither the pharmacological rationale nor experiences with oral spironolactone alone establish the clinical effectiveness of the particular topical preparation examined here. Furthermore, a formulation investigated for acne cannot be assumed to deliver the same amount of drug to scalp follicles as a product specifically manufactured for AGA [11].

A particularly relevant comparator from the published literature is the clinical and dermoscopic study of topical 1% spironolactone reported by Hussein et al. [14]. That work evaluated 26 individuals with AGA, including men and women, after at least six months of daily therapy. Its authors described improvements in selected dermoscopic measures, with different patterns of statistical significance across hair categories and sexes. The similarity in nominal concentration supports the rationale for the present investigation, but the follow-up intervals, patient populations, formulation details, measurement procedures, and quality of comparative evidence differ. A 16-week uncontrolled case series should consequently not be regarded as an independent confirmation of treatment effectiveness at six months or beyond.

Abdel-Raouf et al. investigated topical 1% spironolactone gel, topical minoxidil, and a combination regimen with a substantially longer follow-up and clinical or histopathological assessment [16]. Their work contributes directly relevant evidence about the feasibility of a topical formulation and the potential of combination treatment. It does not, however, establish that the same response rate should occur after 16 weeks in a different hospital, with an incompletely specified vehicle and trichoscopic protocol. Likewise, the comparative study by Ammar et al. evaluated 5% topical spironolactone, 5% minoxidil, and their combination, rather than the present 1% regimen [15]. Concentration-dependent differences in formulation and delivery prevent direct numerical comparison of outcomes across those studies.

Hassan et al. evaluated topical spironolactone against topical minoxidil in female-pattern hair loss, providing evidence from a different comparative clinical design [17]. That study is useful for understanding the emerging topical antiandrogen literature, but its female-only population and comparator-based interpretation cannot be carried over to a mixed-sex uncontrolled series. Yousef et al. also compared topical spironolactone and topical finasteride [12]. Collectively, these investigations justify continued evaluation of topical spironolactone but underline the need for well-designed studies specifying concentration, formulation, treatment adherence, trichoscopic sampling and follow-up duration. The present manuscript adds a shorter-term description of clinical practice, rather than establishing superiority or equivalence relative to minoxidil, finasteride, or combination therapy.

The sex-specific results require particular caution. The tabulated female mean total terminal-hair counts rose from 36.89 to 52.56, whereas the male means rose from 24.82 to 28.91. These descriptive differences may reflect baseline disease characteristics, scalp assessment sites, variability in measurement, or treatment-related factors. The manuscript does not include a valid between-sex statistical test of changes, and its sex-specific means do not consistently reproduce the pooled means or component totals. It would therefore be premature to infer that the topical drug works better in women. Sinclair et al.'s work on oral antiandrogens in female-pattern hair loss is relevant as background on hormonal management, but it involved oral treatment over a longer interval and cannot validate this study's sex-specific topical response estimates [18].

Another exploratory observation concerns disease duration. The manuscript reports response classifications in 17 of 21 participants with disease lasting less than one year, 15 of 29 with disease lasting one to five years, and all ten participants with disease lasting more than five years. The displayed contingency table is consistent with a Pearson chi-square p-value of approximately 0.0064, close to the reported 0.006; however, at least one expected cell count is small, and the original choice of statistical procedure was not documented. More importantly, the apparent 100% response in the longest-duration group comes from only ten patients and may be unstable. The finding should be treated as hypothesis-generating rather than suggesting that chronic AGA is inherently more responsive to topical spironolactone.

Recorded local tolerability was generally favorable: 50 patients reported no adverse effects, six had pruritus, and four had dryness or peeling. These data provide a useful clinical description for the specific 16-week observation period. They do not demonstrate the absence of systemic absorption, hyperkalemia, hormonal effects, or uncommon adverse events, because laboratory surveillance and systematic methods of adverse-event ascertainment were not specified. In addition,

the potential adverse-event profile may differ with formulation, scalp integrity, cumulative use, dose applied, or patient characteristics. Published reviews emphasize the need for stronger controlled evidence and careful reporting of safety, particularly as topical spironolactone is investigated more widely [2, 13].

Outcome definition is a further interpretive challenge. A favorable response was reported in 70.0% of participants, whereas the photographic categories labeled excellent, moderate, and mild improvement together comprise 65.0%. These figures are not necessarily contradictory if they represent different assessment criteria; however, the criteria must be stated explicitly. Hair counts can also vary with field size, magnification, scalp location, hair preparation, and repeatability of photographic analysis. A standardized imaging field and blinded assessment, ideally together with validated clinical photographs and patient-reported outcomes, would greatly improve the interpretability of future work. Moreover, higher counts should not be described as higher hair *density* unless an area denominator is available.

The broader clinical implication is that the reported findings support further investigation of 1% topical spironolactone rather than immediate claims of established effectiveness, comparative superiority, or safety in all patient groups. In future controlled trials, randomization, adequate allocation concealment, a comparator regimen, clear dosing and vehicle information, prespecified definitions of clinical response, standardized trichoscopic measurement, and longer follow-up will help distinguish true drug effects from natural or procedural variation. Until such evidence is available, the present observations are best considered preliminary.

5. LIMITATIONS

Several limitations affect interpretation of the findings. First, the sample was small, derived from a single centre using non-probability sampling, and included only adults aged 18–55 years; the findings may therefore not generalize to older patients or other clinical populations. Second, the absence of a placebo, vehicle, or established active-comparator group prevents attribution of within-participant differences specifically to topical spironolactone. Third, follow-up was limited to 16 weeks, a short period for a chronic hair-growth disorder, and no post-discontinuation observation was available.

Fourth, the exact topical vehicle, volume per dose, adherence checks, prespecified treatment-response threshold, fixed trichoscopic field, standardized photographic procedure, blinding status, and paired-test method were not adequately reported. Fifth, some percentages in the original baseline table were inconsistent with the counts, the marital-status categories did not match between Tables 1 and 4, and several sex-specific component values were inconsistent with pooled trichoscopic summaries in Tables 2 and 5. Direct access to the anonymized study database and original SPSS output is needed to establish definitive corrected values. Sixth, the study did not report serum electrolyte monitoring, pharmacokinetic measurements, systematic assessment of hormonal effects, or the occurrence of rare adverse events. Finally, subgroup associations were exploratory, involved small cells, and were not adjusted for multiple testing or potentially confounding baseline differences. These limitations should be resolved, wherever possible, from primary records before journal submission and in future adequately powered controlled studies.

6. CONCLUSION

In this descriptive case series involving 60 adults with AGA, 16 weeks of once-daily 1% topical spironolactone was associated with increases in the reported mean counts of terminal and total hairs and a decrease in the reported mean vellus-hair count. Forty-two participants (70.0%) were classified as responding to treatment, and most reported no local adverse effects over the observation period. These results offer preliminary clinical observations, but they do not establish that spironolactone caused the changes, that its response is superior to that of existing treatments, or that systemic adverse effects are absent.

The interpretation of the findings is additionally constrained by the absence of a comparator and by unresolved discrepancies among reported table values. Confirmation of the original participant data, treatment-response definition, trichoscopic measurement protocol, statistical tests, and adverse-event assessment is therefore necessary. Larger randomized controlled trials with standardized formulations, blinded and reproducible trichoscopic measurements, clinically meaningful outcome definitions, formal safety monitoring, and longer follow-up are required to determine the efficacy and safety of topical spironolactone for men and women with AGA.

Author Contributions

All authors have contributed equally.

Conflict of Interest

The authors declare that they have no conflicts of interest relevant to the present study.

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Data Availability

Dataset are available from the corresponding author upon reasonable request.

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