Open Access

Original Article

Comparative Evaluation of Hair Density Between Androgenic Alopecia and Normal Scalp in Pakistani Population

Zaaraa Javed, Qamar Uddin Khan*, Hunzala Zafar, Uzma Naeem**

Department of Dermatology, Combined Military Hospital, Jhelum/National University of Medical Sciences (NUMS) Pakistan, *Department of Dermatology, Pak Emirates Military Hospital, Rawalpindi/ National University of Medical Sciences (NUMS) Pakistan, **Department of Dermatology, Army Medical College, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To compare mean hair density in healthy adult versus androgenic alopecia patient's scalp in male Pakistani population

Study Design: Comparative Cross Sectional Study

Place and Duration of Study: Combined Military Hospital, Jhelum, Pakistan at the Department of Dermatology from Jul 2020 to Jan 2021.

Methodology: A sample size of 80 participants was calculated using WHO calculator. Participants were divided into two Groups i.e. Cases of androgenic alopecia and Controls, individuals without hair loss. Cases were defined as patients diagnosed with androgenic alopecia. We measured hair density by manual hair counting method.

Results: Total 80 males were included in study (40 males in each Group). Mean age of participants in Group A (Controls) was 36.8±5.74 and 36.9±5.31 in Group B (AGA). Hair density of one hair follicular unit in normal person at frontal and parietal region was 73.10+5.05 and 63.85+3.40 respectively while in AGA Group at frontal region it was 34.80+1.80 and at parietal region it was 45.10+2.20. Overall hair density was 160.25+16.36 in normal population and 98.75 +8.74 in AGA Group (p=0.02).

Conclusion: Average density of hair and hair loss patterns are variable for different ethnic populations. Hair densities in Pakistani population vary at different scalp site, however, occipital site showed the highest hair density. Hair density decreases with increasing age in Pakistani adult males. We suggest that simple hair counting using 1x1 stamp is effective in counting hair roots in resource limited hospitals and clinics.

Key words: Androgenic Alopecia, Hair density, Hair loss, Pakistan.

How to Cite This Article: *Javed Z, Khan QU, Zafar H, Naeem U. Comparative Evaluation of Hair Density Between Androgenic Alopecia and Normal Scalp in Pakistani Population. Pak Armed Forces Med J 2026; 76(Suppl-8): S1330-S1334. DOI: https://doi.org/10.51253/pafmj.v76iSUPPL-8.8912*

INTRODUCTION

Hair play a substantial role in human appearance and are significantly associated with an individual's self-esteem and perceived attractiveness.[1] Hair loss is a common distressing condition that has severe psychosocial impact on a person's quality of life.[2] American Hair Loss Association reported that American men had some degree of hair loss at ≤35 years of age while 85% men showed hair thinning at the age of >50 years. However, prevalence of hair loss in women is 6% in <50 years and 38% in >70 years.[3] Prevalence of hair loss was found to be 73% in Lahore, Pakistan.[4] Non scarring hair loss is mostly classified into two main types; one is focal and the other is diffuse hair loss. Diffuse hair loss occurs most commonly due to telogen effluvium and its recovery is associated with deletion of participating factors. Focal hair loss is usually secondary to an underlying disorder and results in scarring or non-scaring alopecia.[5] Androgenic alopecia (AGA) is a type of particular pattern hair loss with significant contribution of genetic factors and systemic androgens. In AGA, hair became less pigmented and thin through a process of changing hair growth cycle know as follicular miniaturization.[6] The pathology is common in both gender, however, a high prevalence of AGA was reported in Asian countries.[7] Several methods are available for evaluation of hair loss. Choice of hair loss evaluation method depends upon needs and resources available with dermatologists. Most important parameters for assessment of hair loss are diameter, hair cycle status and hair density. Literature divided hair evaluation methods into three main categories; Noninvasive methods (daily hair count, 60 S hair count, hair weight, hair feathering test, questionnaire, global photographs, contrasting felt examination, dermoscopy, Trichoscan, Standardized wash test and phototrichogram), Semi invasive methods (Trichogram and Unit Area Trichogram) and Invasive methods (Scalp bioscopy).[8] Limited literature

Correspondence: Dr Zaaraa Javed, Department of Dermatology, Combined Military Hospital, Jhelum Pakistan

Received: 19 Jun 2022; revision received: 12 May 2026; accepted: 13 May 2026

is available on measuring hair density, however Park et al. reported that hair density in normal adult male ranges from 117±13/cm2-140±16/cm2 while in AGA Group range was 109±23/cm2-137±17/cm2.[9] Hair loss is very common in Pakistan and associated with serious social stigma. Therefore, it is very important to understand the hair loss and the density measurement for suggestion and prescription of appropriate treatment. Present study was conducted to compare mean hair density in normal adult scalp versus scalps of patients with androgenic alopecia in male Pakistani population.

METHODOLOGY

This comparative cross sectional study was conducted at Department of Dermatology, Combined Military Hospital, Jhelum, Pakistan. This study was conducted from July 2021 to Jan 2022 after ethical approval from ethical review committee of the hospital under ERB (1127/ESTB). A sample size of 80 patients was calculated with power of study 80%, level of significance 5% using WHO calculator.[9]

Inclusion Criteria: Male patients with age ranging from 25-55 years, presenting in out patient department with complaints of hair loss and diagnosed with androgenic alopicia were included in study.

Exclusion Criteria: Patients of both gender, aged above 60 years, known Case of inflammatory skin disorder, patients with other systemic diseases causing alopicia.

Non-probability consecutive sampling technique was used to include the patients. We took written informed consent from all patients before enrolling them into the study. Cases were defined as patients diagnosed with androgenic alopecia (using Hamilton classification I, II, IIA, III, III vertex, IIIA, IV, V, VA IVA, VII). Controls were defined as males who were not experiencing any episodes of excessive hair shedding, hair thinning or any systemic health related issues. We placed 1x1 cm size box (stamp) at selected areas of scalp including vertex, frontal, parietal, temporal and occipital area of both Case and Control population selected. All these stamped areas of scalp were shaved. After shaving each area, 1 x high resolution picture was taken by camera and was later on zoomed to count the hair follicle count manually by post graduate residents i-e For Frontal region: 3cm behind anterior hairline in midline, for Vertex: Point where horizontal and vertical lines meet, for temporal: 3cm above ears and for Occipital: 1cm above the external occipital protuberance.[10]

We analyzed the data using Statistical Package for the Social Sciences (SPSS) version 24. Numerical data was presented as mean and standard deviation while categorical and nominal data was presented as frequency and percentages, we compared hair density among Cases and Controls using independent samples t-test. The *p*-value of ≤0.05 was considered as statistically significant.

RESULTS

Total 80 males were included in study (40 males in each Group). Mean age of participants in Group A (Controls) was 36.8±5.74 and 36.9±5.31 in Group B (AGA). There were 30(75%) participants in ≤35 years age Group and 10(25%) >35 years age Group in both Groups. There were 14(35%) smokers in Group A and 6(15%) smokers in Group B. 8 males (20%) were married in Group A while 6(15%) were married in Group B, (Table-I).

Table-I: Demographics of Patients (n=80)

		Study Group	
		Group A (Controls)	Group B (Androgenetic Alopecia)
No of patients		40	40
Age (years)		36.80±5.74	36.9±5.31
smokers		14(35%)	12(30%)
Marital status		8(20%)	6(15%)
Age Groups	≤35	30(75%)	30(75%)
	>35	10(25%)	10(25%)

Hair density of one hair follicular unit, in normal person, at frontal region was 73.1+5.05 and at parietal region it was 63.85+3.40 while hair density of one hair follicular unit, in AGA Group at frontal region was 34.8+1.8 and at parietal region it was 45.10+2.20 (Figure). Other hair density follicular units in occipital and temporal regions are given in Table-II and III.

Figure: a) Case of hair density measurement a Case of hair density in normal population b) Vertex Stamp c) Frontal Stamp d) Occipital Stamp e) Parietal Stamp f) Temporal Stamp

Table-II: Comparison of Different Hair Follicular Unit at Frontal and Occipital Scalp Positions in Androgenetic Alopecia and Control Groups (n=80)

Hair follicle unit at frontal positions	Normal hair density (n=40) (follicular units per cm²)	Androgenetic Alopecia hair density (n=40) (follicular units per cm²)	*p*-value
1 Hair Follicular Unit	73.10±5.05	34.80±1.80	0.001
2 Hair Follicular Unit	36.70±1.70	24.60±2.06	0.001
3 Hair Follicular Unit	16.25±1.40	11.40±4.10	0.001
4 Hair Follicular Unit	5.35±0.57	3.15±0.80	0.000
>4 Hair Follicular Units	0.90±0.84	0.15±0.36	0.04
Hair Follicle At Occipital Position			
1 Hair Follicular Unit	109.70+5.35	95.00+2.90	0.001
2 Hair Follicular Unit	29.60+2.27	24.05+2.44	0.001
3 Hair Follicular Unit	13.65+1.44	8.40±1.03	0.001
4 Hair Follicular Unit	6.00+0.96	2.75+1.20	0.001
>4 Hair Follicular Units	0.35+0.48	0.10+0.30	0.007

Table-III: Comparison of Different Hair Follicle Unit at Parietal, Temporal and Vertex Scalp positions among Androgenetic Alopecia and Control Groups (n=80)

Hair follicle unit at Parietal positions	Normal hair density (n=40) (follicular units per cm²)	Androgenetic Alopecia hair density (n=40) (follicular units per cm²)	*p*-value
1 Hair Follicular Unit	63.85±3.40	45.1±2.20	0.001
2 Hair Follicular Unit	26.60±1.50	22.85±2.90	0.001
3 Hair Follicular Unit	16.5±1.64	11.55±1.37	0.001
4 Hair Follicular Unit	8.50±0.59	4.35±1.12	0.001
>4 Hair Follicular Units	0.45±0.81	0.20±0.40	0.08
Hair Follicular Unit At Temporal Position			
1 Hair Follicular Unit	63.00±3.40	45.15±2.70	0.001
2 Hair Follicular Unit	29.00±1.80	25.75±2.80	0.001
3 Hair Follicular Unit	15.95±2.03	13.05±1.41	0.001
4 Hair Follicular Unit	0.55±0.98	0.15±0.36	0.01
>4 Hair Follicular Units	0.00±0.10	0.01±0.30	0.154
Hair Follicle At Vertex Position			
1 Hair Follicular Unit	84.55±3.1	54.70±2.17	0.001
2 Hair Follicular Unit	34.70±46.12	17.85±1.16	0.02
3 Hair Follicular Unit	12.10±1.56	7.45±1.17	0.001
4 Hair Follicular Unit	5.50±0.51	2.55±1.03	0.001
>4 Hair Follicular Units	0.25±0.43	0.1±+0.36	0.26

Overall hair density was 160.25±16.36 in normal population and 98.75±8.74 in AGA Group (p=0.02). Hair density at occipital site was (159.80±7.48 vs 130.30±5.1, p=0.01), at frontal site (132.3±5.38 vs 74.10±4.23, p=0.03), parietal site (125.55±43.20 vs 84.05±2.9, p=0.03), temporal site (108.50±6.48 vs 77.20±3.79, p=0.02) and vertex (140.95±44.64 vs 88.30±3.48, p=0.04) as shown in Table-IV.

Our study showed high percentage of hair density at normal and AGA Group in younger age Group while density decreases with in older age Group (p<0.001) as shown in Table-IV.

DISCUSSION

Human hair can grow singly or in the form of Groups of 2,3 or 4. By histological definition these Groups are called follicular units. Pattern hair loss is common type of hair loss in both males and females after puberty. There are several classification systems ranging from simpler system (based in recession of hairline) to more advanced multifactorial systems (based on morphological and dynamic parameters) that affect hair roots and scalp.[11] Hamilton-Norwood classification system for males is commonly used classification.[12] Human hair emerges from scalp in terms of 2-3 units while hair densities and Group patterns are different in AGA and normal adult scalp.[13]

Table-IV: Comparison of overall Hair Density and Hair Density at Different Positions of Scalp

Groups	Hair density (Overall)	Max-Min	*p*-value
Control Group	160.25±16.36	169-74	0.002
Androgenetic Alopecia Group	98.75±8.74	114-84	
Hair density (Occipital)			
Control Group	159.80±7.48	170-115	0.01
Androgenetic Alopecia Group	130.30±5.10	150-100	
Hair density (frontal)			
Control Group	132.3±5.38	150-80	0.03
AGA Group	74.10±4.23	80-45	
Hair density (Parietal)			
Control Group	125.55±43.20	150-95	0.03
Androgenetic Alopecia AGA Group	84.05±2.90	110-60	
Hair density (Temporal)			
Control Group	108.50±6.48	160-100	0.02
Androgenetic Alopecia Group	77.20±3.79	130-80	
Hair density (vertex)			
Control Group	140.95±44.64	130-72	0.04
Androgenetic Alopecia Group	88.30±3.48	90-60	

In our study one hair follicle unit were higher in alopecia Group and it was different at different regions i-e at frontal 34.80±1.80, parietal 45.10±2.20, temporal 45.15±2.70, vertex 54.70±2.17, and occipital 95.00±2.90. Jimenz et al. reported that most common hair unit in AGA patients was 1 hair unit with distinctive dynamic changes in follicular units proportion.[14] A study by Mahapatra S et al. reported that total number of follicle in AGA patients in temporal area was 28.90±4.58 as compared to Controls which are similar to results in our study.[15] Similarly Chen X et al. reported those one hair follicle units were higher in alopecia and different regions it was frontal 47.43±16.82, parietal 34.66±18.26, vertex 39.69±18.38, and occipital 28.32±16.6 which are comparable to our results.[16]

We found significantly high hair density at occipital site i-e 159.80+7.48/cm2 in Pakistani population. These results are similar to results shared by park Ty *et al*. which shows that maximum population of their study Group show maximum hair density in occipit region which was 140±16/cm2.9

Similarly Ortega-Castillejos DK *et al*. reported in their study that average hair density in south east Asians 111.2 hairs/cm2 and in west Asians it was 126.8 hairs/cm2.[17] Hayashi *et al*. reported that average hair density was 181±21SD.[18] A study by Rojhirunsakool S *et al*. reported that average hair density in their research was 163.2±22.6.[19] Sperling *et al*. reported that Africans showed average hair density 171.2±39.8SD at average age of 31.7±8.5SD.[20] Similarly Leerunyakul *et al*. reported that hair density and hair diameters were high in normal scalp at occipit region i-e 160.2 ± 15.3 cm2.[21] The average hair density reported by Birnbaum MR *et al*. is 169±31 cm2 which is comparable to our results.[22] The average hair density reported by Chen X et al was 137.63+25.44 which is similar to our results.[16]

Our study was conducted at one center and small sample size of study limits generalizability of study.

CONCLUSION

Normal scalp Group was more likely to have high hair density as compared to adrogenic alopecia. Hair densities in Pakistani population vary at different scalp site, however, occipital site showed the highest hair density. Hair density decreases with increasing age in Pakistani adult males. We suggest that simple hair counting using 1x1 stamp is effective in counting hair roots in resource limited hospitals and clinics.

Conflict of Interest: None.

Discolure:

Funding Source: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

ZJ & QUK: Conception, study design, drafting the manuscript, approval of the final version to be published.

HZ & UN: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCE

1. Chueh SC, Lin SJ, Chen CC, Lei M, Wang LM, Widelitz R, et al. Therapeutic strategy for hair regeneration: hair cycle activation, niche environment modulation, wound-induced follicle neogenesis, and stem cell engineering. Expert Opin Biol Ther 2013; 13(3): 377-391. http://doi.org/10.1517/14712598.2013.739601
2. Sinikumpu SP, Jokelainen J, Auvinen J, Timonen M, Huilaja L. Association between psychosocial distress, sexual disorders, self-esteem and quality of life with male androgenetic alopecia: a population-based study with men at age 46. BMJ Open 2021; 11(12). http://doi.org/10.1136/bmjopen-2021-049855
3. Dhurat R, Saraogi P. Hair evaluation methods: merits and demerits. Int J Trichol 2009; 1(2): 108-119. http://doi.org/10.4103/0974-7753.58553
4. Ejaz A, Khalid J, Majid S. Pattern and profile of alopecia areata in Pakistan. J Pak Assoc Dermatol 2009; 19(3): 136-140. http://doi.org/10.66344/jpad.19.3.2009.529
5. Cummins DM, Chaudhry IH, Harries M. Scarring Alopecias: Pathology and an Update on Digital Developments. Biomedicines 2021; 9(12): 1755. http://doi.org/10.3390/biomedicines9121755
6. Bhat YJ, Latif I, Hassan I. Female pattern hair loss—An update. Indian Dermatol Online J 2020; 11(4): 493-501. http://doi.org/10.4103/idoj.IDOJ_334_19
7. Salman KE, Altunay IK, Kucukunal NA, Cerman AA. Frequency, severity and related factors of androgenetic alopecia in dermatology outpatient clinic: hospital-based cross-sectional study in Turkey. An Bras Dermatol 2017; 92: 35-40. http://doi.org/10.1590/abd1806-4841.20175241
8. Dervishi G, Liu H, Peternel S, Labeit A, Peinemann F. Autologous platelet-rich plasma therapy for pattern hair loss: A systematic review. J Cosmet Dermatol 2020; 19(4): 827-835. http://doi.org/10.1111/jocd.13113
9. Park TY, Yoo HJ, Park HJ, Kim JK. Comparative evaluation of hair density and Grouped unit pattern between androgenic alopecia and normal scalp. Ann Dermatol 2004; 16(1): 1-5. http://doi.org/10.5021/ad.2004.16.1.1
10. Leerunyakul K, Suchonwanit P. Evaluation of Hair Density and Hair Diameter in the Adult Thai Population Using Quantitative Trichoscopic Analysis. Biomed Res Int 2020; 2020: 2476890. http://doi.org/10.1155/2020/2476890
11. Tajima M, Hamada C, Arai T, Miyazawa M, Shibata R, Ishino A. Characteristic features of Japanese women's hair with aging and with progressing hair loss. J Dermatol Sci 2007; 45(2): 93-103. http://doi.org/10.1016/j.jdermsci.2006.10.011
12. Wirya CT, Wu W, Wu K. Classification of male-pattern hair loss. Int J Trichol 2017; 9(3): 95. http://doi.org/10.4103/ijt.ijt_46_17
13. Martínez-Luna E, Rodríguez-Lobato E, Vázquez-Velo JA, Cuevas-González JC, Martínez-Velasco MA, Toussaint-Caire S. Quantification of hair follicles in the scalp in Mexican Mestizo population. Skin Appendage Disord 2018; 5(1): 27-31. http://doi.org/10.1159/000492443
14. Jimenez F, Ruifernandez JM. Distribution of human hair follicular units: A mathematical model for estimating the donor size in follicular unit transplantation. Dermatol Surg 1999; 25(3): 294-298. http://doi.org/10.1046/j.1524-4725.1999.08299.x
15. Mahapatra S, Kumar D, Subramanian V, Chakrabarti SK, Deb KD. Study on the efficacy of platelet-rich fibrin matrix in hair follicular unit transplantation in androgenetic alopecia patients. J Clin Aesthet Dermatol 2016; 9(9): 29-35.
16. Chen X, Li X, Chen B, Yin Y, Zhang J, Zhou C et al. Female Pattern Hair Loss in Female and Male: A Quantitative Trichoscopic Analysis in Chinese Han Patients. Front Med 2021; 8: 733946. http://doi.org/10.3389/fmed.2021.733946
17. Ortega-Castillejos DK, Pathomvanich D. Retrospective assessment of follicular unit density in Asian men with androgenetic alopecia. Dermatol Surg 2017; 43(5): 672-683. http://doi.org/10.1097/DSS.0000000000001004

18. Hayashi S, Miyamoto I, Takeda K. Measurement of human hair growth by optical microscopy and image analysis. Br J Dermatol 1991; 125(4): 123-129. http://doi.org/ 10.1111/j.1365-2133.1991.tb14775.x
19. Rojhirunsakool S, Suchonwanit P. Parietal scalp is another affected area in female pattern hair loss: an analysis of hair density and hair diameter. Clin Cosmet Investig Dermatol 2018; 11: 7-12. http://doi.org/10.2147/CCID.S149572
20. Sperling LC. Hair density in African Americans. Arch Dermatol 1999; 28(2): 755-763.
21. Leerunyakul K, Suchonwanit P. Evaluation of hair density and hair diameter in the adult Thai population using quantitative trichoscopic analysis. Biomed Res Int 2020: 2476890. http://doi.org/10.1155/2020/2476890
22. Birnbaum MR, McLellan BN, Shapiro J, Ye K, Reid SD. Evaluation of hair density in different ethnicities in a healthy American population using quantitative trichoscopic analysis. Skin Appendage Disord 2018; 4(4): 304-307. http://doi.org/10.1159/000485612