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ORIGINAL ARTICLE

Evaluation of Hair Density and Hair Diameter in The Adult Egyptian Population Using Quantitative Trichoscopic Analysis

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Abstract

Background: **The majority of studies on accepted hair density values has been done in Caucasian additionally Asian populations, whereas there is a scarcity of literature on hair density among Egyptians. Trichoscopy is a rapid and inexpensive technique for assessing hair density that has been effectively used in various investigations and establishing normative value hich can aid in better identifying the presence of disease as well as offering a useful baseline or target when researching and treating hair loss in this group of individuals.**

Aim: **Quantitative trichoscopic measurement will be utilized for determining hair density and hair diameter among adult Egyptians as well as the results are going to be contrasted to people of other ethnicities.**

Patients and methods: **In total, 250 male participants took part in the investigation. Quantitative trichoscopic analysis was applied to examine hair thickness and diameter across four areas on the scalp.**

Results: **There were highly statistically significant alteration among vertex, temporal, and occipital regarding hair, the density besides thickness of hair.**

Conclusion: **Quantitative trichoscopy is a simple, rapid in addition to a painless method for determining hair density. Normal values, which can be established through trichoscopy, should be used when investigating and controlling hair loss in clinical practice.**

Keywords: Hair density, Hair diameter, Quantitative trichoscopic analysis

1. Introduction

Various ethnic communities have been examined to establish averages for hair density and diameter. The diagnosis of hair diseases and the tracking of treatment success can both benefit from the evaluation of normative values for scalp hair. In addition, the values could be used in analyses because of their generalizability. Several surgical and noninvasive techniques are currently available for measuring hair density and hair diameter. In clinical practice as well as multiple types of research investigations, a skin biopsy is one of the invasive approaches used to determine hair parameter. However, pain and scarring make this a less than ideal method for examining the scalp and hair. The wash test, trichoscopy, and the phototrichogram are all noninvasive alternatives.[1]

Prior trials with scalp biopsies suggested variations in hair density and diameter.[2]

Videodermoscopy with an image analysis system, known as quantitative trichoscopic analysis, is a simple, simply reproducible as well as faster technique for determining hair density as well hair diameter and it also yields accurate results, particularly if computer-assisted analysis is incorporated.[3]

Research using phototrichograms has shown that both hair density and hair diameter diminish naturally as people get older.[4]

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2. Patients and methods

This cross-sectional trial was performed on 250 adult Egyptian populations using quantitative trichoscopic.

2.1. Ethical consideration

All participants in the trial provided their written authorization.

2.2. Inclusion criteria

Participants 18 years old or more, and willingness to provide pictures for studies.

2.3. Exclusion criteria

Age below 18 years, experienced self-reported hair loss during the preceding 6-month period, had underlying systemic illnesses were not of Egyptian ancestry, or had used medications or hair products known to inhibit hair growth in the past.

All patients were subjected to the following.

The individual were interviewed and given a full physical examination. An analysis of the scalp as well as hair was performed. Folliscope photos were taken at × 50 magnification to assess hair density in the frontal, temporal, and occipital regions of the scalp in addition × 100 magnification images were taken to assess hair diameter.

2.4. Statistical analysis

Information was gathered, reviewed, coded, and entered into IBM SPSS, version 20 (Statistical Package for the Social Sciences, Armonk, New York, USA). Quantitative data were given as means, SDs in addition to ranges when their distribution was found to be parametric; qualitative data were presented as raw numbers and percentages.

When comparing qualitative data from two groups, the χ^2 test was utilized, whereas the Fisher exact test was used when the predicted count in any cell was below five.

Parametric quantitative data from two separate groups were compared using an independent *t*-test.

The margin of error was set at 5 %, while the confidence interval was set to 95 %. A *P* value of more than 0.05 was deemed not significant, whereas a *P* value of less than 0.05 was regarded significant, and a *P* value of less than 0.001 was regarded highly significant.

Table 1. Distribution of the examined cases according to age, sex, and symptoms of any hair disease.

	$N = 250$
Age	
Mean ± SD	38.10 ± 9.47
Range	22.00–57.00
Sex [*n* (%)]	
Male	250 (100.0)
Symptoms of any hair disease [*n* (%)]	
No	250 (100.0)

3. Results

3.1. Descriptive data

Table 1.

All cases were male and had no symptoms of any hair disease and the ages ranged from 22 to 57 years (mean, 38.10 years).

Regarding the vertex, the hair ranged from 15 to 15 with mean 15, the hair thickness ranged from 0.041 to 0.109 with mean 0.071, and the hair density ranged from 69 to 164 with mean 109.50 (Table 2).

Regarding the temporal, the hair ranged from 15 to 15 with mean 15, the hair thickness ranged from 0.048 to 0.11 with mean 0.076, and the hair density ranged from 62 to 161 with mean 108.54 (Table 3).

Regarding the occipital, the hair ranged from 15 to 15 with mean 15, the hair thickness ranged from 0.05

Table 2. Distribution of the analyzed males in accordance with vertex.

Vertex	$N = 250$		
	Mean ± SD	Median (IQR)	Range
Hair	15.00 ± 0.00	15.00 (15.00–15.00)	15–15
Hair thickness	0.071 ± 0.014	0.070 (0.062–0.080)	0.041–0.109
Hair density	109.50 ± 20.99	108.00 (92.00–122.00)	69–164

Table 3. Dispersion of samples by temporal dimensions.

Temporal	$N = 250$		
	Mean ± SD	Median (IQR)	Range
Hair	15.00 ± 0.00	15.00 (15.00–15.00)	15–15
Hair thickness	0.076 ± 0.015	0.076 (0.065–0.085)	0.048–0.11
Hair density	108.54 ± 21.50	107.00 (93.00–122.00)	62–161

Table 4. Distribution of the researched individuals according to occipital.

Occipital	$N = 250$		
	Mean ± SD	Median (IQR)	Range
Hair	15.00 ± 0.00	15.00 (15.00–15.00)	15–15
Hair thickness	0.085 ± 0.016	0.083 (0.074–0.099)	0.05–0.12
Hair density	111.86 ± 21.17	109.50 (94.00–128.00)	72–165

Table 5. Comparative analysis among vertex, temporal also occipital regarding hair, hair thickness, and hair density.

	Vertex	Temporal	Occipital	Test value[a]	*P* value	Significance
Hair						
Mean ± SD	15.00 ± 0.00	15.00 ± 0.00	15.00 ± 0.00	NA	NA	NA
Range	15–15	15–15	15–15			
Hair thickness						
Mean ± SD	0.071 ± 0.014	0.076 ± 0.015	0.085 ± 0.016	7483.871	0.000	HS
Range	0.041–0.109	0.048–0.11	0.05–0.12			
Hair density						
Mean ± SD	109.50 ± 20.99	108.54 ± 21.50	111.86 ± 21.17	6800.811	0.000	HS
Range	69–164	62–161	72–165			

P value more than 0.05 (NS); *P* value less than 0.05 (S); *P* value less than 0.01: (HS).
[a] Repeated measure analysis of variance.

to 0.12 with mean 0.085, and the hair density ranged from 72 to 165 with mean 111.86 (Table 4).

3.2. Analytical statistics

There were highly statistically significant difference between vertex, temporal, and occipital regarding hair, hair thickness, and hair density (Table 5).

4. Discussion

Researchers have examined a number of different ethnic groups to establish averages for hair thickness and diameter. To properly diagnose hair issues and track treatment progress, it is helpful to evaluate normative values for scalp hair. In addition, the values could be used in studies because of their generalizability. Several surgical and noninvasive techniques are currently available for measuring hair density and hair diameter.[5]

Prior trials using scalp biopsy proposed that hair density and diameter diverse at changed sites of the scalp,[2,6] besides this has been established by numerous research studies by means of computer-assisted phototrichograms.[7,8] Another factor informed to affect hair density besides hair diameter is senior. Skin biopsies exposed a reduction in hair counts and number of follicular units in patients of older age.[2]

Experiments using phototrichograms also showed that hair density as well as hair diameter diminished as a natural consequence of aging.[4,9] Hair characteristics varied marginally by sex, but these distinctions were not statistically significant.[4,10]

The researchers wanted to use Quantitative Trichoscopic Analysis to assess the hair density as well hair diameter of various ethnic groups, so they tested it out on 250 Egyptian adults.

The current study showed that, the hair ranged from 15 to 15 with mean 15 among vertex, temporal, and occipital each. Hair thickness and hair density were significantly higher among occipital than vertex and temporal.

This agrees with Alsharif and AlGhamdi[11] who reported that, the hair density varied significantly among all three areas, with the densest hair being seen in the occipital regions. The occipital region had the thickest hair, by far and away the largest variation in diameter across the three areas. According to their data, when comparing hair density and hair diameter across diverse races, the Arab population has a bigger diameter but lower density than people of African, Asian, Caucasian, and Hispanic heritage.[7,12]

Computer-assisted phototrichograms have been employed in other studies with similar results to ours, confirming our findings.[8,13]

In contrast to our findings, an earlier investigation on the Thai population found no significant change in hair diameter between the various locations of the scalp.[5]

To estimate the hair density of the typical Chinese population, Hu et al.[14] compared the results of quantitative trichoscopy analysis with those of a pathologic examination. They demonstrated that hair density varies at different locations, with the vertex having the highest density.

Using scalp biopsies measuring 4 mm in diameter, researchers in Taiwan discovered that the total quantity of hair varied among scalp regions, although these variations were not statistically significant.[2] According to the outcomes, the frontal region had the highest density and the temporal region had the lowest.

Similar results, but with lesser values, were found in an additional study that included specimens from the vertex region in Brazil; the highest parameters were also found there.[6]

Prior studies with automated phototrichograms showed that hair density was highest in the mid-scalp and lowest in the parietal regions.[13,15] Our trial confirmed that density varied by location on the

scalp, with the occipital region having the highest and the vertex region having the lowest.

Hair follicle development during embryogenesis involves various interactions among epithelial and mesenchymal cells, which may account for the variation in hair density across the scalp.[16] The Wnt pathway is one of many signals that transduce from mesenchymal cells to produce a placode during the first stage of hair follicular morphogenesis, which in turn leads to the creation of the hair germ.

We postulate the variations in hair follicle density at various regions on the scalp are linked to differences in the number of mesenchymal cells that are able to ignore the signals. On the other hand, among people of the same race, there was no variation in hair diameter, suggesting a constant follicular size across the entire scalp. Human hair diameter is thought to be determined by certain genes that show significant interethnic variation.[17]

Using trichoscopy, Birnbaum et al.[7] determined that the mean density of hair varied from 169 ± 31 to 178 ± 33 for American Hispanic individuals, from 148 ± 25 to 160 ± 27 for African American individuals as well as 214 ± 28 to 230 ± 33 for Caucasian individuals. The average density of hair in previous studies was greater than the average density of hair in our study's Egyptian community.

According to Hu et al.,[14] the hair density, vellus ratio, along with hair shaft diameter in the occipital region were 163.07 ± 28.17 cm^2, 6.60 ± 3.95 %, and 74.52 ± 8.02 μm, respectively.

The occipital vellus hair ratio reported by Chen et al.[18] was 8.88 ± 4.23 %.

Birnbaum et al.[7] and Loussouarn et al.[19] described the hair density in the vertex area (226 ± 20 vs. 248 ± 51 cm^2) and occipital area (214 ± 28 vs. 224 ± 43 cm^2) of Caucasians in the USA. They used dissimilar trichoscopic devices also analysis programs.

We also think that the same genetic variables for hair growth are present in the whole population. Whereas in patients with male and female pattern hair loss (AGA and FPHL), respectively, hair density as well hair diameter declines differently. A number of studies point to polymorphisms in androgen-related genes as the likely cause of male AGA, although FPHL may have a distinct etiology and be unrelated to a hormone-driven mechanism.[20]

Our study showed that, all cases were male and all cases were no symptoms of any hair disease and the ages ranged from 22 to 57 years (mean, 38.10 years).

According to research done on Chinese women, the average rate at which hair diameter decreases peaks in their 40s.[21]

Atkinson et al.[22] found that the diameter of white people's hair peaked in their early 20s and then gradually decreased with age.

Age-related loss of hair density was shown by Leerunyakul and Suchonwanit,[5] although the decline was not statistically significant until individuals were in their 60s. In addition, when comparing their findings to those of other studies, they discovered discrepancies in the average diameter of hair. There was no discernible change in hair thickness throughout the age ranges. Also, their findings revealed that hair follicular stem cells lose their self-renewal capacity and expand in size as they age due to a process called senescence. The frequency of hair loss is known to increase with age. Several prior investigations indicated that hair density and hair diameter vary with age, even in the absence of hair loss.

4.1. Conclusion

Hair density can be measured quickly, easily, and with no any discomfort with the help of quantitative trichoscopy. In clinical practice, trichoscopy can be used to establish normal values that can be used to evaluate and treat hair loss in comparison to.

Consent statement

It was approved by written consent.

Conflicts of interest

There are no conflicts of interest.

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