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A Cross-Sectional Study on Androgenetic Alopecia in Male Patients and Prevalence of Dyslipidemia Amongst Them

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ABSTRACT
One kind of non-cicatricial alopecia is Androgenetic Alopecia. It's defined as a type of hair loss that often follows a characteristic pattern, with scalp hair follicles producing less hair fiber over time and eventually becoming smaller. To evaluate the lipid profile of Androgenetic Alopecia patients and then determine the dyslipidemia prevalence in them. Subjects who met the inclusion and exclusion criteria and provided written informed consent were considered enrolled in the study. The mean Total Cholesterol of the patients in N-H STAGING 2 was 166.8750±28.0187, N-H STAGING 3 was 187.0625±45.8287, N-H STAGING 4 was 210.5217±51.1574, N-H STAGING 5 was 229.5556±59.6660, N-H STAGING 6 was 222.7500±19.8557 and the mean Total Cholesterol distribution using N-H staggered was statistically significant (p = 0.0035). We came to the conclusion that people with androgenic alopecia may develop cardiovascular disease and other metabolic syndromes as a result of their high lipid readings, in addition to other reasons.

INTRODUCTION

One kind of alopecia that is not cicatricle is Androgenetic Alopecia. It's defined as a type of hair loss that often follows a characteristic pattern, with scalp hair follicles producing less hair fiber over time and eventually becoming smaller.

Aetiology of Androgenetic Alopecia is multifactorial and can be categorized as under:

Genetic: Autosomal dominant, polygenic and inherited from either parent.

Hormonal effects: Male pattern baldness is caused by testosterone and more significantly, by its powerful metabolite dihydrotestosterone (DHT). Higher androgen receptor numbers, functional androgen receptor polymorphisms, higher local DHT synthesis, or decreased local DHT degradation can all contribute to intrafollicular androgen (DHT) hyperactivity.

Role of Oxidative Stress: Direct involvement in mediating dermal papilla cell-stimulated TGF-β secretion, which is known to decrease hair development.

Hair Cycle Dynamics: With every additional cycle, the length of telogen increases and the duration of anagen diminish. The anagen phase is ultimately so brief that the growing hair is unable to reach the skin's surface, leaving an empty follicular pore behind.

Contact with Arrector Pili Muscle (APM): Reversing hair follicle shrinking may need good contact between APM and the bulge, which is frequently absent in Androgenetic Alopecia.

A group of cardiovascular risk factors known as metabolic syndrome (MetS) comprises abdominal obesity, dyslipidemia, hypertension, diabetes and pre-diabetes and hypertension. It is currently unclear how androgenic alopecia and MetS are related. Research has indicated an increased occurrence of metabolic syndrome and coronary heart disease in Androgenetic Alopecia[1].

Limited research has evaluated the correlation between Androgenetic Alopecia and dyslipidemia. There are very few epidemiological data on Androgenetic Alopecia in this region of the nation. This study aims to evaluate the frequency of dyslipidemia and the epidemiological profile of male patients with Androgenetic Alopecia.

Research has demonstrated a correlation between dyslipidemia and coronary heart disease[2].

Dyslipidemia is significantly more common in Androgenetic Alopecia patients, which may signal a higher risk of cardiovascular disease development. This highlights the importance of carefully screening Androgenetic Alopecia patients and taking the necessary precautions to prevent issues from arising from them.

MATERIALS AND METHODS

Study Design: Institution based cross sectional study. Study setting: School of Tropical Medicine, Kolkata. Study period: 1 year, starting from 1st March 2020.

Study Population: Patients attending dermatology OPD at School of Tropical Medicine, Kolkata.

Sample Size: 100 patients approximately.

Sample Design: All consecutive male patients with clinical diagnosis of Androgenetic Alopecia stage II and above.

Subject Enrolment: Subjects were deemed to be enrolled in study after acquiring a written informed consent and fulfilling inclusion, exclusion criteria.

Inclusion Criteria:

- New male patients of age 18 years and above with clinical diagnosis of Androgenetic Alopecia stage II and above
- Patients willing to participate in study

Exclusion Criteria:

- Old cases of Androgenetic Alopecia on treatment and follow up
- Patients unwilling to participate in study
- New patients of Androgenetic Alopecia with any prior history of dyslipidemia, hypertension, diabetes mellitus

Study Variables: To determine the epidemiological profile of Androgenetic Alopecia:

- Age
- Occupation
- Income status
- Educational status
- Family history

To determine the clinical profile of Androgenetic Alopecia:

- Duration
- Norwood-Hamilton staging of alopecia

To evaluate lipid profile:

- Total serum cholesterol (mg dL^{-1})
- Serum triglycerides (mg dL^{-1})
- Serum HDL (mg dL^{-1})
- Serum LDL (mg dL^{-1})

Study tools:

- OPD register
- Case sheet
- Patient consent form
- Tools to draw blood for examination:
  - Gloves
  - Syringe
  - Cotton with spirit
  - Vial
  - Digital camera

RESULT AND ANALYSIS

The mean Total Cholesterol (Mean±S.D.) of the patients in N-H STAGING 2 was 166.8750±28.0187. The mean Total Cholesterol (Mean±S.D.) of the patients in N-H STAGING 3 was 187.0625±45.8287. The mean Total Cholesterol (Mean±S.D.) of the patients in N-H STAGING 4 was 210.5217±51.1574. The mean Total Cholesterol (Mean±S.D.) of the patients in N-H STAGING 5 was 229.5556±59.6660 (Table 1). The mean Total Cholesterol (Mean±S.D.) of the patients in N-H STAGING 6 was 222.7500±19.8557. The mean Total Cholesterol distribution using N-H staggered was statistically significant (p = 0.0035). The mean HDL (Mean±S.D.) of the patients in N-H STAGING 2 was 41.3750±7.5708. The mean HDL (Mean±S.D.) of the patients in N-H STAGING 3 was 42.5000±8.7859. The mean HDL (Mean±S.D.) of the patients in N-H STAGING 4 was 41.2174±12.6166. The mean HDL (Mean±S.D.) of the patients in N-H STAGING 5 was 35.7778±9.5757 (Table 2). The mean HDL (Mean±S.D.) of the patients in N-H STAGING 6 was 43.0000±13.1403. The mean HDL distribution using N-H staggered was not statistically significant (p = 0.4624). The mean LDL (Mean±S.D.) of the subjects in N-H STAGING 2 was 100.8750±16.3783. The mean LDL (Mean±S.D.) of the patients in N-H STAGING 3 was 105.1458±27.8995. The mean LDL (Mean±S.D.) of the patients in N-H STAGING 4 was 112.2609±30.2508 (Table 3). The mean LDL (Mean±S.D.) of the patients in N-H STAGING 5 was 117.6667±24.3772. The mean LDL (Mean±S.D.) of the patients in N-H STAGING 6 was 140.0000±9.1287. The mean LDL distribution using N-H staggered was not statistically significant (p = 0.0592). The mean VLDL (Mean±S.D.) of the patients in N-H STAGING 2 was 25.4375±9.5706. The mean VLDL (Mean±S.D.) of the patients in N-H STAGING 3 was 26.5625±11.1849. The mean VLDL (Mean±S.D.) of the patients in N-H STAGING 4 was 30.5217±14.6003. The mean VLDL (Mean±S.D.) of the patients in N-H STAGING 5 was 41.0000±21.9773. The mean VLDL (Mean±S.D.) of the patients in N-H STAGING 6 was 30.5000±12.2882. The mean VLDL distribution using N-H staggered was statistically significant (p = 0.0358) (Table 4).

DISCUSSION

This institution-based cross-sectional study began on March 1, 2020, at the School of Tropical Medicine in Kolkata. This study comprised newly diagnosed male patients (18 years of age and older) who were willing to participate and had a clinical diagnostic of Androgenetic Alopecia stage II and above. Total 100 patients were present in this study.

We observed that, 13 (13.0%) patients were $\leq$20 years of age, 66 (66.0%) patients were 21-30 years of age, 19(19.0%) patient were 31- 40 years of age and 2 (2.0%) patients were 41-50 years of age. Present study showed that, 14 (14.0%) patients were Govt. Service, 35 (35.0%) patients had Private Service, 36 (36.0%) patient were Student and 2 (2.0%) patients were Teacher in Occupation.

We examined that, 16 (16.0%) patients were B.COM, 2 (2.0%) patient were B. SC, 17(17.0%) patients were B TECH, 13 (13.0%) patients were BA, 2 (2.0%) patients were BCOM, 10 (10.0%) patients were BSC, 4 (4.0%) patients were Class 10,13 (13.0%) patients were

Table 1: Distribution of mean Total Cholesterol: N-H STAGING

Total Cholesterol	Number	Mean	SD	Minimum	Maximum	Median	p-value
N-H STAGING2	16	166.8750	28.0187	114.0000	202.0000	174.0000	0.0035
N-H STAGING3	48	187.0625	45.8287	110.0000	300.0000	178.5000	
N-H STAGING4	23	210.5217	51.1574	119.0000	280.0000	225.0000	
N-H STAGING5	9	229.5556	59.6660	165.0000	372.0000	210.0000	
N-H STAGING6	4	222.7500	19.8557	208.0000	250.0000	216.5000	

Table 2: Distribution of mean HDL: N-H STAGING

HDL	Number	Mean	SD	Minimum	Maximum	Median	p-value
N-H STAGING2	16	41.3750	7.5708	28.0000	52.0000	39.5000	0.4624
N-H STAGING3	48	42.5000	8.7859	20.0000	68.0000	42.5000	
N-H STAGING4	23	41.2174	12.6166	20.0000	70.0000	39.0000	
N-H STAGING5	9	35.7778	9.5757	24.0000	53.0000	34.0000	
N-H STAGING6	4	43.0000	13.1403	25.0000	55.0000	46.0000	

Table 3: Distribution of mean LDL: N-H STAGING

LDL	Number	Mean	SD	Minimum	Maximum	Median	p-value
N-H STAGING2	16	100.8750	16.3783	71.0000	123.0000	104.0000	0.0592
N-H STAGING3	48	105.1458	27.8995	64.0000	191.0000	100.0000	
N-H STAGING4	23	112.2609	30.2508	54.0000	186.0000	103.0000	
N-H STAGING5	9	117.6667	24.3772	95.0000	169.0000	119.0000	
N-H STAGING6	4	140.0000	9.1287	130.0000	150.0000	140.0000	

Table 3: Distribution of mean VLDL: N-H STAGING

VLDL	Number	Mean	SD	Minimum	Maximum	Median	p-value
N-H STAGING2	16	25.4375	9.5706	11.0000	48.0000	23.5000	0.0358
N-H STAGING3	48	26.5625	11.1849	10.0000	68.0000	26.0000	
N-H STAGING4	23	30.5217	14.6003	9.0000	60.0000	25.0000	
N-H STAGING5	9	41.0000	21.9773	21.0000	87.0000	34.0000	
N-H STAGING6	4	30.5000	12.2882	21.0000	48.0000	26.5000	

class 12, 2 (2.0%) patients were Graduate, 4 (4.0%) patients were MA, 2 (2.0%) patients were MBA, 3(3.0%) patients were MBBS and 2 (2.0%) patients were UG Student in Education.

The data from our present study showed that, 7 (7.0%) patients Brother were positive history, 2 (2.0%) patients were Father and Brother were positive history and 45 (45.0%) patients Father were positive history. We examined that, 9 (9.0%) patients Brother were positive. Present study showed that, 47 (47.0%) patients Father were positive.

Qazi *et al*.[3] found that of the 100 male Androgenetic Alopecia patients (age range 21-50, mean 34.49), 36 had grade II Androgenetic Alopecia, 24 had grade III Androgenetic Alopecia, 20 had grade IV Androgenetic Alopecia, 15 had grade V Androgenetic Alopecia and 5 had grade VI Androgenetic Alopecia. Forty Androgenetic Alopecia patients had severe Androgenetic Alopecia and sixty individuals had mild-to-moderate Androgenetic Alopecia.

The data from our present study showed that, 16 (16.0%) patients had 2 N-H STAGING, 48 (48.0%) patients had 3 N-H STAGING, 23 (23.0%) patients had 4 N-H STAGING, 9 (9.0%) patients had 5 N-H STAGING and 4 (4.0%) patients had 6 N-H STAGING.

The current investigation revealed that the patients' mean age (Mean±S.D.) was 27.1200±5.7827. We looked at the patients' mean income (Mean±S.D.) and found that it was 21170.0000±42883.9296. The current investigation revealed that the patients' mean duration in months (Mean±S.D.) was 29.8700±21.1185. Qazi *et al*.[3] found that It was discovered that Androgenetic Alopecia patients had a statistically significant higher prevalence of dyslipidemia than the control group. Additionally, the study found that individuals with severe Androgenetic Alopecia had a statistically significant higher prevalence of disordered lipid profiles than patients with mild-to-moderate Androgenetic Alopecia. The results of this study indicate that patients with androgenetic alopecia, particularly those with severe grades, have a higher prevalence of dyslipidaemia when compared to controls. This suggests that patients with androgenetic alopecia, particularly those with severe grades, are at a higher risk of developing dyslipidaemia and other cardiovascular co morbidities.

We checked to see if the patients' mean N-H STAGIN (Mean±S.D.) was 3.3700±.9914. The current investigation revealed that the patients' mean Total CH (Mean±S.D.) was 194.4800±48.4871. According to the study's results, the average TG (Mean±S.D.) of the patients was 148.3600±62.7607. We looked at the patients' mean HDL (Mean±S.D.). It was 41.4400±9.8446. The current investigation revealed that the patients' mean LDL (Mean±S.D.) was 108.6200±27.0173. We looked at the patients' mean VLDL (Mean±S.D.) and found that it was 28.7500±13.5217.

We found that in N-H STAGING 2, 5 (31.3%) patients were ≤20 years of age, 10 (62.5%) patients were 21-30 years of age and 1 (6.3%) patient was 31-40 years of age, In N-H STAGING 3, 7 (14.6%) patients were ≤20 years of age, 35 (72.9%) patients were 21-30 years of age, 5 (10.4%) patients were 31-40 years of age and 1 (2.1%) patients were 41-50 years of age, In N-H STAGING 4, 1 (4.3%) patients were ≤20 years of age, 16 (69.6%) patients were 21-30 years of age and 6 (26.1%) patients were 31-40 years of age, N-H STAGING 5, 4 (44.4%) patients was 21-30 years of age and 5 (55.6%) patients were 31-40 years of age, N-H STAGING 6, 1 (25.0%) patients were 21-30 years of age, 2 (50.0%) patients was 31-40 years of age and 1(25.0%) patients were 41-50 years of age. So, the association of Age in Group with N-H STAGING was statistically significant (p = 0.0010).

Our study showed that in N-H STAGING 2, 1(6.3%) patient's Brother had positive history and 6 (37.5%) patient's Father had positive history, In N-H STAGING 3, 4 (8.3%) patient's Brother had positive history and 17 (35.4%) patient's Father had positive History, In N-H STAGING 4, 1 (4.3%) patient's Brother had positive History, 1 (4.3%) patient's Father and Brother had positive history and 16 (69.6%) patient's Father had positive History, N-H STAGING 5, 6 (66.7%) patient's Father had positive History, N-H STAGING 6, 1 (25.0%) patient's Brother had positive History and 1 (25.0%) patient's Father and Brother had positive history. So, the association of Family History with N-H STAGING was statistically significant (p = 0.0071).

We found In N-H STAGING 2, 4(25.0%) patients had Higher Secondary degree, 8(50.0%) patients had Higher Secondary degree and 4(25.0%) patients had Post Graduate degree. In N-H STAGING 3, 10(20.8%) patients had Higher Secondary degree, 26(54.2%) patients had Higher Secondary degree and 12(25.0%) patients had Post Graduate degree. In N-H STAGING 4, 1(4.3%) patients were Illiterate, 3(13.0%) patients had Higher Secondary degree, 13(56.5%) patients had Higher Secondary degree and 6(26.1%) patients had Post Graduate degree. N-H STAGING 5, 2(22.2%)

patients had Higher Secondary degree, 4(44.4%) patients had Higher Secondary degree and 3(33.3%) patients had Post Graduate degree. N-H STAGING 6, 1(25.0%) patients had Higher Secondary degree and 3(75.0%) Higher Secondary degrees were held by the patients. The relationship between EDUCATION and N H STAGING lacked statistical significance (p = 0.9157). The current investigation revealed that in N-H STAGING 2, the average patient age was 23.3125±4.6722, Patients in N-H STAGING 3 had an average age of 26.1250±4.8712, while those in N-H STAGING 4 had an average age of 28.5652±4.7370, The average patient age in N-H STAGING 5 was 31.8889±5.3255 and The average patient age in N-H STAGING 6 was 35.2500±10.8128. So, There was statistical significance in the mean age distribution using N-H labeling (p<0.0001).

We discovered that the mean income of patients in N-H STAGING 2 was 6437.5000±9316.4281, In N-H STAGING 3, patients' average income was 22687.5000±58177.7015, In N-H STAGING 4, patients' average income was 22086.9565±19933.7837, the mean income of the patients in N-H STAGING 5 was 31333.3333±27631.5038 and Patients' mean income in N-H STAGING 6 was 33750.0000±23584.9528. So, There was no statistically significant difference in the mean income distribution with N-H staggered (p = 0.5983).

According to our research, the typical duration of patients in months for N-H STAGING 2 was 13.2500±8.1609, The mean duration of patients in months in N-H STAGING 3 was 25.9167±17.5509, The mean duration of patients in months in N-H STAGING 4 was 35.7826±20.4405, The mean duration of patients in months in N-H STAGING 5 was 49.3333±9.3808 and The mean duration of patients in months in N-H STAGING 6 was 66.0000±37.3095. Thus, there was statistical significance in the mean Duration in months distribution using N-H STAGING (p<0.0001).

We looked at the fact that the mean Total Cholesterol of patients in N-H STAGING 2 was 166.8750±28.0187, The mean Total Cholesterol of the patients in N-H STAGING 3 was 187.0625±45.8287, The mean Total Cholesterol of the patients in N-H STAGING 4 was 210.5217±51.1574, The mean Total Cholesterol of the patients in N-H STAGING 5 was 229.5556±59.6660 and The mean Total Cholesterol of the patients in N-H STAGING 6 was 222.7500±19.8557.

Thus, the mean Total Cholesterol distribution using N-H tracking was statistically significant (p = 0.0035).

Mahalle *et al*.[4] found hypercholesterolemia, In the entire study population, hypertriglyceridemia and low high density lipoprotein (HDL) were found in 23.3, 63.0 and 54.6% of cases, respectively. There was a 41.3% overall prevalence of atherogenic dyslipidemia (high TG and low HDL). Compared to hypercholesterolemia, there was a greater connection between traditional and non-traditional risk variables and low HDL and high TG. In contrast to hypercholesterolemia, hypertriglyceridemia and low HDL cholesterol are more prevalent in CAD patients. This implies that patients with CAD in India need a different preventive approach.

Akın *et al*.[5] compared In male patients with and without Androgenetic Alopecia, serum triglyceride (TG) and high density lipoprotein (HDL) cholesterol levels are two indicators of metabolic syndrome. The forty patients in the study group had an Androgenetic Alopecia of 2 or above. Forty individuals, either with stage 1 Androgenetic Alopecia or no Androgenetic Alopecia at all at the time of the clinical evaluation made up the control group. The study and control groups' fasting serum TG and HDL cholesterol levels were compared. The mean serum TG values in the study group were 89.60; the mean serum TG values in the control group were 85.40.

We discovered that the mean TG of the patients in N-H STAGING 2 was 127.7500±54.3182, The mean TG of the patients in N-H STAGING 3 was 147.8333±75.2783, The mean TG of the patients in N-H STAGING 4 was 153.0000±49.0964, The mean TG of the patients in N-H STAGING 5 was 175.2222±32.5145 and The mean TG of the patients in N-H STAGING 6 was 150.0000±36.7696. Thus, there was no statistically significant difference in the mean TG distribution using N-H STAGING (p = 0.4838).

Devi *et al*.[6] found statistically significant increased prevalence of raised TGL levels (p = 0.002), raised LDL levels (p = 0.024), low HDL levels (p = 0.0001), diabetes mellitus (p = 0.004) was also observed in Androgenetic Alopecia. Androgenetic Alopecia and MetS are clearly related and patients with Androgenetic Alopecia that is more severe and has lasted longer have a statistically significant prevalence of MetS. For all individuals with Androgenetic Alopecia, screening is necessary to detect diabetes mellitus, dyslipidemia and MetS early enough to prevent long-term morbidity.

It was discovered that in N-H STAGING 2, patients' mean HDL was 41.3750±7.5708, In N-H STAGING 3, the patients' average HDL was 42.5000±8.7859, The average HDL of the patients in N-H STAGING 4 was 41.2174±12.6166, The patients' mean HDL in N-H STAGING 5 was 35.7778±9.5757 and In N-H STAGING 6, the patients' average HDL was 43.0000±13.1403. Therefore, the mean HDL distribution using N-H STAGING was not statistically significant (p = 0.4624).

Kim *et al*.[7] found that the serum total cholesterol, TG and LDL cholesterol levels were significantly higher in the Androgenetic Alopecia group than in the control group and the standardized mean differences were 0.377 (95% confidence interval [CI]: 0.182-0.572,

p<0.001), 0.426 (95% CI: 0.164-0.688, p = 0.001) and 0.450 (95% CI: 0.171-0.728, p = 0.002) respectively. In addition, HDL cholesterol level was significantly lower in the Androgenetic Alopecia group than in the control group and the standardized mean difference was -0.248 (95% CI: -0.472 to -0.023, p = 0.030). Androgenetic Alopecia patients showed statistically significant abnormal lipid profiles and this might partly explain the association between Androgenetic Alopecia and cardiovascular diseases.

Our study showed that in N-H STAGING 2, the mean LDL of patients was 100.8750±16.3783, In N-H STAGING 3, the mean LDL of patients was 105.1458±27.8995, In N-H STAGING 4, the mean LDL of patients was 112.2609±30.2508, In N-H STAGING 5, the mean LDL of patients was 117.6667±24.3772 and In N-H STAGING 6, the mean LDL of patients was 140.0000±9.1287. So, the distribution of mean LDL with N-H STAGING was not statistically significant (p = 0.0592).

Additionally, we discovered that the mean VLDL of patients in N-H STAGING 2 was 25.4375±9.5706, In N-H STAGING 3, the patients' average VLDL was 26.5625±11.1849, In N-H STAGING 4, the patients' average VLDL was 30.5217±14.6003, In N-H STAGING 5, the patients' average VLDL was 41.0000±21.9773 and In N-H STAGING 6, the patients' average VLDL was 30.5000±12.2882. Thus, the mean VLDL distribution using N-H STAGING was statistically significant (p = 0.0358).

CONCLUSION

We came to the conclusion that people with androgenic alopecia may develop cardiovascular disease and other metabolic syndromes as a result of their high lipid readings, in addition to other reasons. For patients with early-onset androgenic alopecia, early screening for dyslipidemia and its constituents is therefore advantageous.

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