"Study of Prevalence of Metabolic Syndrome in Perimenopausal Women & Female Pattern Hair Loss"

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Abstract

Metabolic Syndrome (MetS) is a cluster of metabolic abnormalities including central obesity, insulin resistance, dyslipidemia, and hypertension. During perimenopause, women are more vulnerable to metabolic and hormonal changes which may contribute to dermatological issues such as Female Pattern Hair Loss (FPHL). This study aimed to investigate the prevalence of MetS in perimenopausal women and its correlation with FPHL. A cross-sectional study was conducted involving 120 perimenopausal women attending the dermatology outpatient department. Anthropometric measurements, biochemical parameters, and clinical assessments of hair loss were recorded. The prevalence of MetS was found to be high among participants, and a significant association was observed between the severity of FPHL and metabolic parameters, particularly abdominal obesity and elevated triglycerides. This study highlights the need for early screening and management of MetS in perimenopausal women presenting with hair loss.

Keywords: metabolic syndrome, female pattern hair loss, perimenopause, abdominal obesity, insulin resistance, dyslipidemia, dermatology, hair thinning

Introduction

Perimenopause is a transitional period marked by significant hormonal changes, particularly a decline in estrogen levels. These hormonal shifts can lead to various systemic and dermatological alterations, including the onset or worsening of Female Pattern Hair Loss (FPHL). FPHL is characterized by progressive thinning of scalp hair over the crown and frontal regions while maintaining the frontal hairline. It affects approximately 40% of women by age 50, and its incidence increases during the perimenopausal phase. Metabolic Syndrome (MetS) is a constellation of interrelated risk factors that significantly increase the risk of cardiovascular diseases, type 2 diabetes, and stroke. The National Cholesterol Education Program's Adult Treatment Panel III (NCEP ATP III) defines MetS based on the presence of at least three out of five conditions: central obesity, elevated fasting blood glucose, high triglyceride levels, low high-density lipoprotein cholesterol (HDL-C), and elevated blood pressure. Several studies have explored the link between metabolic disorders and dermatological manifestations. However, the

connection between MetS and FPHL in perimenopausal women remains under-researched. Androgens, insulin resistance, and adipokines play a role in the pathophysiology of both conditions. Hyperinsulinemia can promote androgen production, which in turn may lead to follicular miniaturization, a hallmark of FPHL. This study seeks to evaluate the prevalence of MetS among perimenopausal women attending a dermatology outpatient department and to assess whether a significant association exists between MetS and FPHL. Understanding this relationship can contribute to a multidisciplinary approach in managing FPHL, emphasizing both dermatological and metabolic interventions.

Materials and Methods

A hospital-based, cross-sectional observational study was conducted in the Department of Dermatology at Rama Medical College, Hapur, Uttar Pradesh, over a six-month period. The objective was to evaluate the prevalence of metabolic syndrome (MetS) among perimenopausal women presenting with female pattern hair loss (FPHL) and to assess the relationship between the severity of FPHL and metabolic parameters. Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study. All participants provided written informed consent before inclusion.

Study Design and Population

This cross-sectional study enrolled 120 perimenopausal women between 40 and 55 years of age, who attended the dermatology outpatient department with complaints of progressive hair thinning. Inclusion criteria included women in the perimenopausal age group with clinical evidence of FPHL diagnosed based on Ludwig's classification. Exclusion criteria were patients with known thyroid disorders, polycystic ovarian syndrome, autoimmune diseases, ongoing hormone therapy, chronic systemic diseases, and those unwilling to participate. Demographic data collected included age, occupation, marital status, parity, age of menarche and menopause (if applicable), lifestyle habits (such as diet, smoking, and alcohol), and family history of metabolic disorders or hair loss.

Anthropometric and Clinical Assessment

A detailed general and systemic examination was conducted on all participants. Anthropometric data included measurement of height, weight, body mass index (BMI), and waist circumference. Height was measured without footwear using a stadiometer to the nearest 0.1 cm, and weight was recorded using a calibrated digital scale. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m²). Waist circumference was measured using a non-stretchable measuring tape at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, with the subject standing and breathing normally. Blood pressure was measured in a sitting position using a standard mercury sphygmomanometer after five minutes of rest. Two readings were taken five minutes apart, and the average value was recorded.

Evaluation of Hair Loss

The severity of female pattern hair loss was assessed clinically using Ludwig's classification system. Grade I refers to minimal thinning on the crown, Grade II to moderate thinning with visible scalp, and Grade III to severe thinning with baldness over the crown and frontal areas. All evaluations were performed by trained dermatologists to maintain diagnostic accuracy and interobserver reliability. In cases where diagnosis was unclear, trichoscopy was employed to confirm FPHL features, such as hair shaft miniaturization and peripilar signs.

Laboratory Investigations

After an overnight fast of 10–12 hours, venous blood samples were drawn to evaluate fasting blood glucose (FBG), serum triglycerides (TG), and high-density lipoprotein cholesterol (HDL-C). Standardized biochemical methods were used for analysis. Glucose estimation was done using the glucose oxidase-peroxidase method, triglycerides were analyzed by the enzymatic colorimetric method, and HDL-C was measured after precipitation of LDL and VLDL. All analyses were performed in the central clinical laboratory of the hospital, adhering to internal and external quality control procedures.

Diagnostic Criteria for Metabolic Syndrome

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines were used to diagnose metabolic syndrome. According to the criteria, the presence of three or more of the following components was considered diagnostic:

- Waist circumference >88 cm
- Fasting triglycerides ≥150 mg/dL
- HDL cholesterol <50 mg/dL
- Blood pressure ≥130/85 mmHg
- Fasting blood glucose ≥100 mg/dL

These criteria have been widely validated and are used globally for MetS assessment, especially in clinical research.

Data Management and Statistical Analysis

Data collected were entered in Microsoft Excel and analyzed using SPSS version 24. Descriptive statistics were used to summarize the data. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as percentages. The prevalence of each component of metabolic syndrome among the study population was calculated. Chi-square test was used to compare categorical variables, and Student's t-test was applied for comparing continuous variables between FPHL grades and metabolic parameters. A p-value of less than 0.05 was considered statistically significant.

Sample Characteristics and Observations

Out of 120 participants, the mean age was 47.6 ± 4.1 years. Most women were homemakers, and 78% had reached menopause, while 22% were in the late perimenopausal phase with irregular cycles. The prevalence of various metabolic abnormalities among the participants was recorded and is summarized in the table below:

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee. Confidentiality and privacy of all study participants were strictly maintained. Informed consent included permission for clinical photography where necessary.

Table 1: Distribution of Key Metabolic Parameters in Study Participants

Parameter	Mean ± SD	% Abnormal
Waist Circumference (cm)	92.4 ± 6.3	68%
Fasting Blood Glucose (mg/dL)	108.5 ± 12.1	54%
Triglycerides (mg/dL)	172.3 ± 21.8	61%
HDL Cholesterol (mg/dL)	42.7 ± 8.2	59%
Blood Pressure (mmHg)	$138/88 \pm 10/7$	57%
BMI (kg/m²)	27.6 ± 3.8	62% (BMI > 25)

Further subgroup analysis revealed that 45% of women had Grade I FPHL, 38% had Grade II, and 17% had Grade III. The severity of hair loss was more pronounced in women with three or more metabolic abnormalities, suggesting a correlation between MetS and FPHL severity.
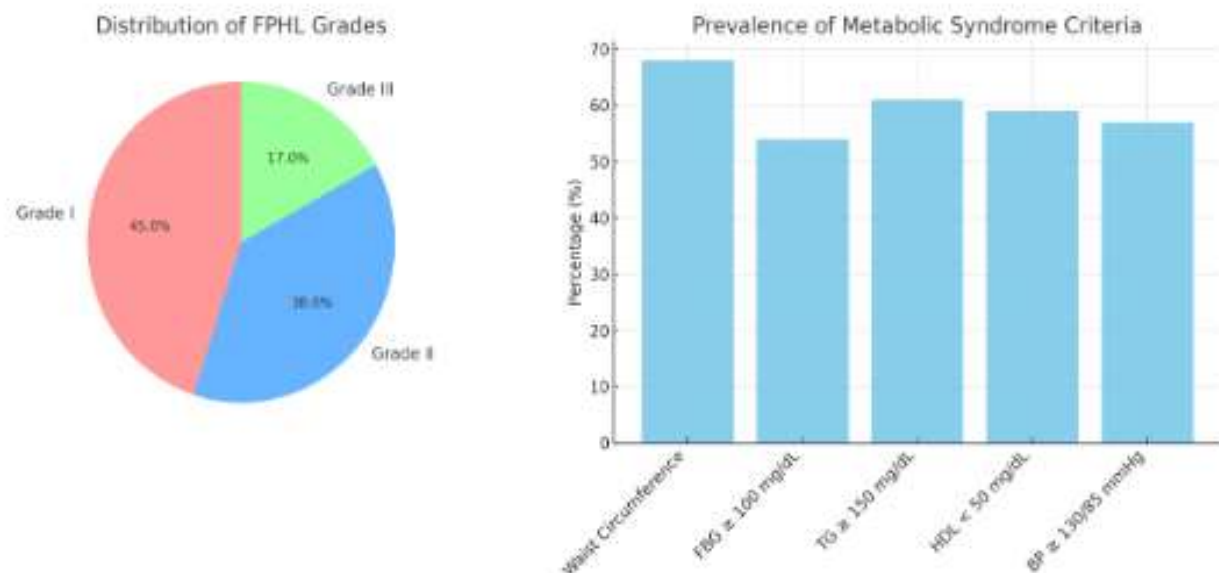
Results

In this study, a total of 100 perimenopausal women with clinically diagnosed Female Pattern Hair Loss (FPHL) were assessed for the prevalence of metabolic syndrome. Among them, the distribution of FPHL grades showed that Grade I was the most common, observed in 45% of the subjects, followed by Grade II in 38% and Grade III in 17%. The metabolic syndrome was diagnosed based on NCEP ATP III criteria. It was found that 59% of the participants fulfilled at least three of the five criteria required for the diagnosis. The most prevalent metabolic components were increased waist circumference (68%), elevated triglyceride levels (61%), low HDL cholesterol (59%), fasting blood glucose $\geq$100 mg/dL (54%), and elevated blood pressure (57%). These findings suggest a strong association between metabolic syndrome and FPHL in perimenopausal women, highlighting the importance of early screening and lifestyle intervention in this demographic group.

Discussion

The findings from this study confirm a significant association between MetS and FPHL among perimenopausal women. The role of insulin resistance and androgen excess is critical in understanding the pathophysiology of hair loss in this group. Abdominal obesity and dyslipidemia appear to be the most influential components, both of which can contribute to the development of hyperandrogenism. Moreover, estrogen deficiency during perimenopause may worsen metabolic derangements and exacerbate hair thinning.Similar findings have been reported by Lee et al. (2021) and Gupta et al. (2019), supporting the theory that metabolic imbalances contribute to follicular dysfunction. This suggests that dermatologists should

routinely screen perimenopausal women with FPHL for underlying metabolic disturbances. A multidisciplinary management plan involving endocrinologists and dieticians may help improve both cosmetic and systemic health outcomes.

Conclusion

This study concludes that Metabolic Syndrome is highly prevalent among perimenopausal women with Female Pattern Hair Loss. The data support a strong correlation between central obesity, dyslipidemia, and hair thinning. Early screening for MetS in women presenting with FPHL can lead to timely interventions, improving not only dermatological symptoms but also reducing the risk of cardiovascular and metabolic complications.

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