Clinical Characteristics of Female Patterned Hair Loss in Patients Attending Hair Clinic in Thailand

Warayuwadee Amornpinyo, M.D., Rattapon Thuangtong, M.D., Supisara Wongdama, M.D., Daranporn Triwongwaranat, M.D.

Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: To study the clinical features and associated factors of female pattern hair loss (FPHL) in premenopausal and menopausal women patients.

Materials and Methods: This is a retrospective chart review of FPHL patients visited hair clinic, Siriraj Hospital from June 2012 to May 2015. Demographic data, family history and history of hair loss were evaluated. Factors associated with FPHL were analysed.

Results: There were 267 patients (180 premenopausal women and 87 menopausal women) in this study. The mean age of onset of patients was 35.5±12 years (premenopausal FPHL) and 60.5±7 years (menopausal FPHL). Positive family history of androgenetic alopecia (AGA) was 48.3%, mainly in first-degree relatives. The data showed an increased incidence of FPHL with advancing age. The most common presentation is Ludwig grade I. The study showed that patients also have dyslipidemia (16.9%), hypertension (16.5%), diabetes mellitus (10.9%), hypothyroidism (4.9%), anemia (3.7%), and hyperthyroidism (2.9%). In multivariate analysis, significant associations were found between low ferritin level <70 µg/L and premenopausal FPHL (OR 5.51, 95% CI 2.26-15.14, P = 0.01).

Conclusion: Maternal family history of AGA seems to have a greater influence on premenopausal FPHL. Low serum ferritin levels <70 µg/L were significantly associated with FPHL in premenopausal women.

Keywords: Female pattern hair loss; androgenetic alopecia; family history; ferritin; premenopause; menopause (Siriraj Med J 2022; 74: 19-26)

Abbreviations
OR : Odds ratio
CI : confidence Interval

INTRODUCTION

Female pattern hair loss (FPHL) is a common cause of non-scarring alopecia, resulted from the miniaturization of hair follicles. This condition presents as a diffuse hair loss and prominent in the frontal, crown and parietal areas. In contrast to other scalp diseases such as tinea capitis and scalp psoriasis, the patients typically present with patchy hair loss and erythematous plagues with silvery scales, respectively.[1,2] Patients with FPHL have a lower self-image and a lower quality of life. The prevalence of FPHL is varied among ethnicities and increases with age.[3] The overall prevalence is lower in the Asian population (5.6% in the Korean study of Paik et al.)[3] compare to Caucasians (19% in the US study of Mansouri et al.).[4] In addition, one study recently conducted in Thailand reported the prevalence of disorders of skin appendages was 1.0% during the five-year period.[5]

Corresponding author: Daranporn Triwongwaranat
Email: d.triwongwaranat@gmail.com
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ORCID ID: https://orcid.org/0000-0001-7388-1249
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The pathophysiology of this condition is not well established. The role of androgens in FPHL is different from male pattern hair loss. Individuals with 5-α reductase deficiency or androgen insensitivity syndrome still have FPHL.[6] Estrogen may also play a protective role through inhibition of 5-α reductase which explain the higher prevalence in menopausal group.[7] Other findings that associated to this condition such as insulin resistance, metabolic syndrome, coronary artery disease, hypothyroidism, hyperprolactinemia, breast feeding, ultraviolet light exposure were reported.[8-12] The diagnosis can be made mainly by history taking and physical examination. Skin biopsy is not necessary except for differentiating it from other causes of hair loss. The laboratory evaluations for thyroid function, ferritin level, and androgen state are essential in some cases with suspicious history.

There were mostly publications about the prevalence and risk factors related to FPHL in Western and few Asian studies from South Korea, Taiwan, China and India.[3,10,13,14] As prominent differences in the prevalence and factors of female pattern hair loss in difference countries and race are known. This study investigates about these aspects in different backgrounds which might have various impacts on the effects of these factors. For providing more information of FPHL management in the future.

MATERIALS AND METHODS

Study design

A retrospective chart review of female pattern hair loss patients visited hair clinic, Department of Dermatology, Siriraj Hospital, Mahidol University, a tertiary center in Bangkok, Thailand from June 2012 to May 2015 was performed. The study protocol was approved by the Siriraj Institutional Review Boards. The diagnosis of female pattern hair loss was made by a dermatologist based on history taking, physical examination of pattern of hair loss based on Ludwig type and excluded other causes of hair loss. The data obtained from medical records including demographic data, family history of pattern hair loss, medical history, underlying disease, menstruation history, pregnancy and lactation history in past 12 months, significant weight loss in 6 months, features of hyperandrogenism (e.g. seborrhea, severe acne, infertility, hirsutism, overweight), detailed history of hair loss, physical examination by using Ludwig's classification and laboratory investigation (hemoglobin, hematocrit, creatinine, HbA1C, thyroid stimulating hormone, serum ferritin, antinuclear antibody, antithyroid antibody) at diagnosis were noted.

Sample size calculation and statistical analysis

Since no previous study compared clinical characteristics between premenopausal and menopausal FPHL patients, the sample size was calculated based on the family history of AGA in FPHL patients. Previous studies in Korean and China reported 45.2% and 32.4% of FPHL patients had family history of AGA, respectively.[3,15] The estimated family history of AGA in FPHL patients was 40% with 6% error, therefore a total sample size of 257 patients was needed.

Data was analysed using statistical package for social science (SPSS) software version 18 statistical programs. The chi-square test was performed to compare categorical data. *P* values using the traditional cutoff of *P* less than 0.05 were calculated to determine statistical significance. A logistic regression and multivariable regression model were used to evaluate the relationship of each possible risk factor to FPHL.

RESULTS

There were 316 patients with a medical record diagnosis of ICD10 L64.9 Androgenetic alopecia, unspecified in Hair clinic, Department of Dermatology, Siriraj Hospital, Mahidol University from June 2012 to May 2015. The subjects were divided into 2 groups by the first presentation of FPHL, premenopause and menopause. Premenopause is defined as the whole of the reproductive period before the menopause, while menopause is defined as the permanent cessation of menstruation.[16] Of the 316 patients, 49 patients diagnosed with alopecia areata were excluded. 267 eligible patients (180 premenopausal women and 87 menopausal women) met the criteria for this study.

Characteristics of FPHL

Of the 267 patients, the mean age of hair loss onset among all patients was 43.5±15 years. The mean age of onset of premenopausal FPHL patients was 35.5±12 years, while 60.5±7 years was noted in menopausal FPHL patients (Table 1).

Family history

Both male and female relatives with androgenetic alopecia (AGA) counted as family history. A positive family history of AGA was found in 129 of 267 (48.3%) patients and mainly 121 of 267 (45.3%) patients noted in history of first-degree relatives. 66 of 267 (24.7%) patients reported a family history of AGA in paternal relatives, 27 of 267 (10.1%) patients in maternal relatives, 36 of 267 (13.5%) patients in both paternal and maternal relatives and 138 of 267 (51.7%) patients had no family history of AGA (Table 1).

TABLE 1. Characteristics of female pattern hair loss patients: Medical profiles

Patients	Premenopause (n=180)	Menopause (n=87)	Total (n=267)
Age of onset (years), mean±SD	35.5 ± 12	60.5 ± 7	43.5 ± 15
Race, n (%)			
Thai	180 (100)	85 (97.7)	265 (99.3)
Non-Thai	0 (0.0)	2 (0.3)	2 (0.8)
Family history of AGA, n (%)	95 (52.7)	34 (39.1)	129 (48.3)
1st degree	87 (48.3)	34 (39.1)	121 (45.3)
2nd degree	8 (4.4)	0 (0.0)	8 (2.9)
3rd degree	0 (0.0)	0 (0.0)	0 (0.0)
Parental family history of AGA, n (%)			
None	85 (47.2)	53 (60.9)	138 (51.7)
Paternal family history	47 (26.1)	19 (21.8)	66 (24.7)
Maternal family history	23 (12.8)	4 (4.6)	27 (10.1)
Both positive	25 (13.9)	11 (12.6)	36 (13.5)
Postpartum in 1 year, n (%)	2 (1.1)	0 (0.0)	2 (0.8)
Significant weight loss, n (%)	0 (0.0)	1 (0.1)	1 (0.4)
Menstruation, n (%)			
Regular	154 (85.6)	69 (79.3)	223 (83.2)
Irregular	23 (12.8)	11 (12.6)	34 (12.7)
Hyperandrogenism, n (%)	6 (3.3)	0 (0.0)	6 (2.3)
Seborrhea	1 (0.1)	0 (0.0)	1 (0.4)
Severe acne	4 (2.2)	0 (0.0)	4 (1.5)
Infertility	6 (3.3)	0 (0.0)	6 (2.3)
Hirsutism	2 (0.1)	0 (0.0)	2 (0.8)
Overweight	1 (0.1)	0 (0.0)	1 (0.4)
Underlying disease, n (%)	50 (27.8)	63 (72.4)	113 (42.3)
Vitiligo	0 (0.0)	0 (0.0)	0 (0.0)
Hypothyroidism	8 (4.4)	5 (5.8)	13 (4.9)
Hyperthyroidism	5 (2.8)	3 (3.5)	8 (2.9)
Atopy	0 (0.0)	0 (0.0)	0 (0.0)
Dyslipidemia	14 (7.8)	31 (35.6)	45 (16.9)
Anemia	9 (5.0)	1 (1.2)	10 (3.8)
Diabetes mellitus	8 (4.4)	21 (24.1)	29 (10.9)
Hypertension	8 (4.4)	36 (41.4)	44 (16.5)
Previous treatment, n (%)	34 (18.9)	16 (18.4)	50 (18.7)
Topical minoxidil	34 (18.9)	15 (17.2)	49 (18.4)
Oral antiandrogen	0 (0.0)	1 (1.2)	1 (0.4)
History of taking OCP, n (%)	11 (6.1)	3 (3.5)	14 (5.2)
Smoking, n (%)	0 (0.0)	0 (0.0)	0 (0.0)
Duration, n (%)			
<3 months	18 (10.0)	9 (10.3)	27 (10.1)
3-6 months	25 (13.9)	13 (14.9)	38 (14.2)
>6-12 months	15 (8.3)	4 (4.6)	19 (7.1)
>1-2 years	38 (21.1)	22 (25.3)	60 (22.5)
>2-5 years	41 (22.8)	18 (20.7)	57 (21.4)
> 5 years	42 (23.3)	22 (25.3)	64 (23.9)
Hair manipulation, n (%)	18 (10.0)	14 (16.1)	32 (11.9)
Coloring	17 (9.5)	6 (6.9)	23 (8.6)
Straightening	7 (3.9)	3 (3.4)	10 (3.8)
Flat iron	0 (0.0)	0 (0.0)	0 (0.0)
Hair dryer	1 (0.1)	0 (0.0)	1 (0.4)
Curling	11 (6.1)	9 (10.3)	20 (7.5)

*Significant at $P = 0.05$, Data expressed as mean±SD or n (%); AGA, androgenetic alopecia; OCP, oral contraceptive pill.

Association between FPHL and possible risk factors

In the univariate analysis, many factors were associated with having early onset FPHL. Statistically significant associations were noted between premenopausal FPHL and these factors: dyslipidemia (OR 0.15, 95% CI 0.07-0.30, $P = 0.01$), diabetes mellitus (OR 0.14, 95% CI 0.06-0.35, $P = 0.01$), hypertension (OR 0.01, 95% CI 0.03-0.15, $P = 0.01$), family history of AGA (OR 1.72, 95% CI 1.02-2.90, $P = 0.04$), maternal family history (OR 3.06, 95% CI 1.02-9.14, $P = 0.03$), low level of thyroid stimulating hormone <0.27 μIU/ml (OR 0.14, 95% CI 0.03-0.77, $P = 0.01$), low ferritin level <70 μg/L (OR 2.81, 95% CI 1.15-6.86, $P = 0.02$) and positive antinuclear antibody (OR 0.16, 95% CI 0.03-1.06, $P = 0.04$) (Table 2).

Independent factors were analysed by multivariable regression model. Significant associations were found between low ferritin level <70 μg/L and premenopausal FPHL (OR 5.51, 95% CI 2.26-15.14, $P = 0.01$) (Table 3).

Past medical history

There were 2 patients (0.8%) with each history of postpartum and lactation within 1 year and only one patient (0.4%) with significant weight loss in 6 months. 14 of 267 (5.2%) patients reported history of taking oral contraceptive pill within 6 months. Regular menstruation was found in 223 of 267 (83.2%) of patients. Only 6 patients (2.3%) had got the features of hyperandrogenism. There were common medical problems among patients included dyslipidemia (16.9%), hypertension (16.4%), diabetes mellitus (10.9%), hypothyroidism (4.9%), anemia (3.7%) and hyperthyroidism (2.9%) in respectively (Table 1).

Previous treatment history

50 of 267 (18.7%) patients reported history of previous treatment for FPHL. Topical minoxidil was used in majority of patients (18.4%) and one patient (0.4%) had been treated with oral antiandrogen (Table 1).

History of hair loss

For most patients, the time from hair loss onset to seeing a hair specialist was longer than one year. There was previous history of hair manipulation in 32 of 267 (11.9%) patients including hair coloring (8.6%), curling (7.5%), straightening (3.8%) and hair dryer (0.4%) (Table 1).

Overall, the age-specific prevalence of female pattern hair loss (FPHL) increased with advancing age and peaked in age group 50-59 years (24.7%). Most patients (61.0%) were Ludwig grade I, followed by grade II (29.2%) and grade III (9.7%). The age-specific prevalence of severe hair loss (Ludwig grade ≥II) was relatively increasing; however, it was slightly lower in those aged 40-49 years. There were mostly recorded Ludwig grade I in patients with age group 0-19 years and Ludwig grade ≥ II in age group 50-59 years (Fig 1).

DISCUSSION

As prominent differences in the prevalence and factors of female pattern hair loss in difference countries and race are known. No study regarding the clinical characteristics and factors associated with FPHL in Thailand has been reported. This study investigated in difference background which might have various impacts on the effects of these factors. In this study demonstrated the trend of increased incidence of FPHL with advancing age and Ludwig grade I was the most common type, similar to previous studies in other population.[3,15,17-22] Ludwig grade ≥ II were more common in patients aged ≥50 years. This may be due to the fact that less cosmetically concern about hair loss in older adults and higher Ludwig grade with advancing age may be influenced by the duration of disease progression. Although most patients in this study were premenopausal cases, the trend of increased incidence of FPHL with advancing age was observed.

FPHL can occur in any time of life. The mode of inheritance in AGA has not been characterised. There were previous reports of higher prevalence of AGA in patients with paternal rather than maternal inheritance, similarly to this study.[20,23] Moreover, female patients were more likely to have positive maternal family history.[23,24] Specifically, this study demonstrated that positive maternal family history was statistically significantly associated with premenopausal FPHL. This may be due to some inherited genes from maternal side. Further studies are needed to determine the association of early onset FPHL and family history of AGA in FPHL patients. The youngest patient with a positive maternal family history of AGA was 16 years old. These results suggested that paternal family history of AGA has more effect on FPHL than maternal family history of AGA. However, maternal family history of AGA was seem to be greater influence in premenopausal FPHL.

Hypertension, insulin resistance and increased cardiovascular risk have been described associated with early onset FPHL compared with healthy subjects.[9] Possible explanations were higher aldosterone, C-protein, D-dimer and insulin levels in women with FPHL.[9] This study demonstrated that menopausal women with FPHL had higher rate of hypertension, dyslipidemia, diabetes mellitus. There may be explained by more commonly

TABLE 2. Univariate analyses of risk factors associated with early onset female pattern hair loss

Patients, n (%)	Premenopause n=180	Menopause n=87	Total n=267	OR	95% CI	*P* Value
Irregular menstruation	23 (12.8)	11 (12.6)	34 (12.7)	1.06	0.49-2.31	0.87
History of OCP	11 (6.1)	3 (3.5)	14 (5.2)	1.82	0.49-6.71	0.36
Hyperandrogenism	6 (3.3)	0 (0.0)	6 (2.3)	0.66	0.61-0.73	0.08
Underlying disease						
Hypothyroidism	8 (4.4)	5 (5.8)	13 (4.9)	0.76	0.24-2.42	0.64
Hyperthyroidism	5 (2.8)	3 (3.5)	8 (2.9)	0.80	0.19-3.43	0.76
Dyslipidemia	14 (7.8)	31 (35.6)	45 (16.9)	0.15	0.07-0.30	0.01*
Anemia	9 (5.0)	1 (1.2)	10 (3.7)	4.52	0.56-36.30	0.12
Diabetes mellitus	8 (4.4)	21 (24.1)	29 (10.9)	0.14	0.06-0.35	0.01*
Hypertension	8 (4.4)	36 (41.4)	44 (16.4)	0.01	0.03-0.15	0.01*
Family history of AGA	95 (52.7)	34 (39.1)	129 (48.3)	1.72	1.02-2.90	0.04*
1st degree	87 (48.3)	34 (39.1)	121 (45.3)	1.47	0.87-2.48	0.14
2nd degree	8 (4.4)	0 (0.0)	8 (2.9)	0.66	0.61-0.72	0.04*
3rd degree	0 (0.0)	0 (0.0)	0 (0.0)	-	-	-
Parental family history of AGA						
None	85 (47.2)	53 (60.9)	138 (51.7)	-	-	-
Paternal family history	47 (26.1)	19 (21.8)	66 (24.7)	1.35	0.74-2.47	0.33
Maternal family history	23 (12.8)	4 (4.6)	27 (10.1)	3.06	1.02-9.14	0.03*
Both paternal and maternal	25 (13.9)	11 (12.6)	36 (13.5)	1.12	0.52-2.40	0.77
Hemoglobin <12 g/dl	23/123 (18.7)	8/73 (11.0)	31/176	1.87	0.78-4.43	0.15
Hematocrit <36 %	22/123 (17.9)	15/73 (20.5)	37/196	0.84	0.41-1.75	0.65
Abnormal TSH						
TSH <0.27 µIU/mL	2/66 (3.0)	6/34 (17.6)	8/100	0.14	0.03-0.77	0.01*
TSH >4.20 µIU/mL	6/66 (9.1)	3/34 (8.8)	9/100	1.03	0.24-4.41	0.96
Low ferritin level						
Ferritin <40 µg/L	27/86 (31.4)	6/29 (20.7)	33/115	1.75	0.64-4.80	0.27
Ferritin <70 µg/L	48/86 (55.8)	9/29 (31.0)	57/115	2.81	1.15-6.86	0.02*
Positive ANA	7/24 (29.2)**	5/7 (71.4)***	12/31	0.16	0.03-1.06	0.04*

*Significant at $P = 0.05$, Data expressed as mean±SD or n (%); *OR,* odds ratio; *CI*, confidence interval

**Positive ANA pattern in premenopausal FPHL including fine speckle with titer of 1:640, fine speckle with titer of 1:160, fine speckle with titer of 1:100, fine speckle with borderline titer, borderline ANA, titer of 1:2560 with no data of ANA pattern and no data of ANA pattern and titer

***Positive ANA pattern in menopausal FPHL including fine speckle with titer of 1:640, fine speckle with titer of 1:320, nucleolar with titer of 1:320, fine speckle with borderline titer and borderline ANA

AGA, androgenetic alopecia; OCP, oral contraceptive pill; TSH, thyroid stimulating hormone; ANA, antinuclear antibody

TABLE 3. Multivariate analyses of risk factors associated with early onset female pattern hair loss

Patients	Univariate analysis			Multivariate analysis		
	OR	95% CI	*P* Value	OR	95% CI	*P* Value
Age	0.77	0.72-0.83	0.008*	0.99	0.98-1.01	0.58
Family history of AGA	1.72	1.02-2.90	0.04*	1.21	0.07-21.44	0.84
Maternal family history	3.05	1.02-9.14	0.03*	2.84	0.24-32.96	0.40
Dyslipidemia	0.15	0.07-0.30	0.01*	0.18	0.06-1.66	0.51
Diabetes mellitus	0.14	0.06-0.35	0.01*	0.64	0.08-5.57	0.36
Hypertension	0.01	0.03-0.15	0.01*	0.54	0.09-3.96	0.48
Ferritin <70 µg/L	2.81	1.15-6.86	0.02*	5.51	2.26-15.14	0.01*

*Significant at $P = 0.05$, Data expressed as mean±SD or n (%); *OR*, odds ratio; *CI*, confidence interval
AGA, androgenetic alopecia; OCP, oral contraceptive pill

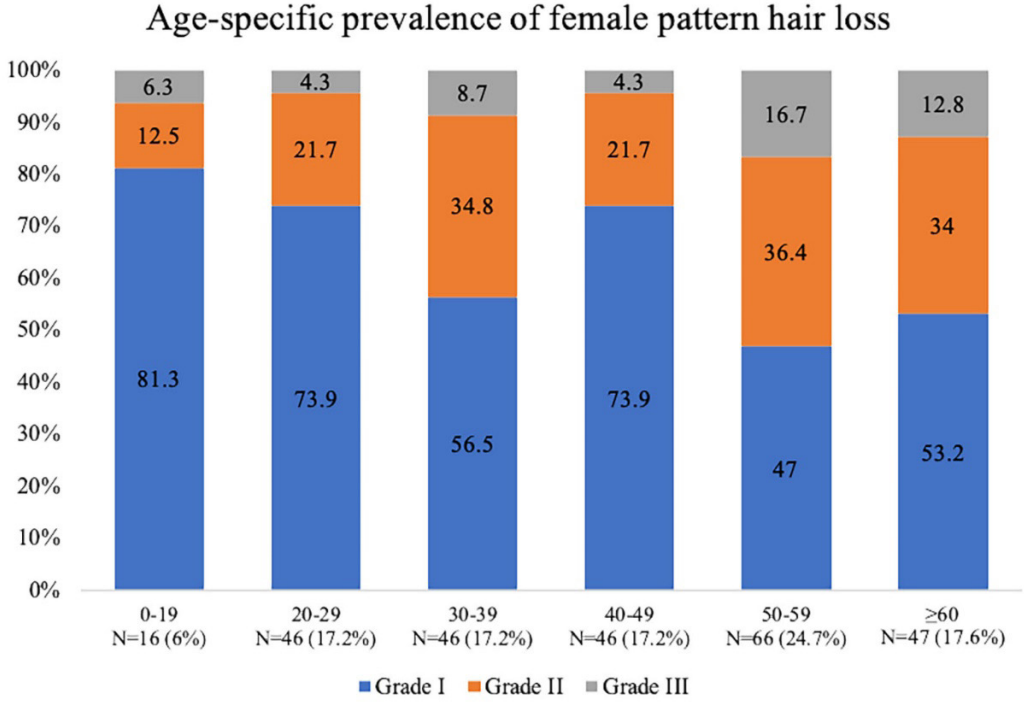

Fig 1. Age-specific prevalence of female pattern hair loss (FPHL)

increasing frequency of those in elderly patients. However, further comparative study will be needed to evaluate the association between hypertension, insulin resistance and increased cardiovascular risk to FPHL.

Previous studies have noted the relationship of iron deficiency and FPHL. Whether defined iron deficiency by using serum ferritin level, the definition has ranged from serum ferritin level less than or equal to 15 µg/L, less than or equal to 40 µg/L. The sensitivity of using those cut-off level of serum ferritin level was 59%, 98% in respectively, with about 99%, 98% specificity based on comparison with complete absence of iron staining on bone marrow aspiration.[25-27] Coenen et al.[25] noted that all patients with serum ferritin less than 70 µg/L had a lack of macrophage and/or sideroblast iron stains on bone-marrow aspiration and would be considered to have iron deficiency anemia. Rushton et al.[28] reported that there was increased scalp hair shedding and decreased

hair volume in women with serum ferritin less than of equal to 70 µg/L. In 2003, Kantor et al.[29] found a lower mean serum ferritin level in FPHL patients who was under 40 years old (mean = 37.3 µg/L; n = 52) than control subjects (mean = 59.5 µg/L; n = 11). In this study, mean level of ferritin in FPHL patients was higher (mean = 212.15±206 µg/L) compared to previous studies.[29,30] There did seem to be lower mean of ferritin level in menopausal (mean = 84.94±100.9 µg/L; n = 87) than premenopausal (mean = 201.67±248.5 µg/L; n = 180) FPHL patients. The results could be related to differences in the diet, genetic, ethnic variations of the study populations and lack of data pertaining to FPHL in our country. Furthermore, this study demonstrated that serum ferritin levels <70 µg/L were significantly associated with FPHL in premenopausal women which was similar to previous studies.[28,31] However, some studies did not support the association between FPHL and iron deficiency.[32-34] No established guideline for routine investigations and role of iron supplement therapy in women with FPHL. Due to various cut-off levels of ferritin, we commonly prescribed iron supplement to FPHL patients with serum ferritin levels <70 µg/L based on previous studies[25,28,34] and several reasons. First, cut-off level of ferritin >70 could cover more patients with iron deficiency anemia. Moreover, we also found that giving iron supplement in FPHL patients with serum ferritin level <70 µg/L helped their hair regrowth and decreased hair shedding. However, additional comparative study with larger sample sizes of the correlation between FPHL and iron deficiency status or responsiveness of oral iron supplement are necessary to answer the efficacy of iron supplement therapy in FPHL patient.

The limitation of the present study are some missing data due to retrospective approach. Furthermore, the study is from a single center and may not accurately represent the general population. Further case control design or population based descriptive study helps to identify the exact prevalence and risk factors of FPHL patients.

CONCLUSION

In conclusion, this study described clinical characteristics of FPHL and the factors associated with FPHL in premenopausal and menopausal female. Maternal family history of AGA was seem to be greater influence in premenopausal FPHL. Moreover, low serum ferritin levels <70 µg/L were significantly associated with FPHL in premenopausal women.

Conflicts of Interest: None declared

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