Original Article

J Babol Univ Med Sci
23; 2021. P: 98-104

Comparison of Fatty Liver Disease in Men with and without Androgenetic Alopecia

S. Fallah Arzpeyma (MD)[1], R. Rafiei (MD)*[2], S. Zamani (MD)[1], E. Rafiei (MSc)[3]

1.Department of Radiology, School of Medicine, Guilan University of Medical Sciences, Rasht, I.R.Iran

2.Skin Research Center, Department of Dermatology, Razi Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, I.R.Iran

3.Razi Clinical Research Development Unit, Guilan University of Medical Sciences, Rasht, I.R.Iran

J Babol Univ Med Sci; 23; 2021; PP: 98-104

Received: Nov 29th 2019, Revised: May 17th 2020, Accepted: Jun 23rd 2020.

ABSTRACT

BACKGROUND AND OBJECTIVE: Fatty liver disease is the most common chronic liver disorder, which is introduced as part of the metabolic syndrome. On the other hand, androgenetic alopecia in men, which is the most common cause of hair loss, can also be associated with cardiovascular disease and metabolic disorders. Due to the common risk factors for fatty liver and androgenetic alopecia, this study was performed to compare the frequency of fatty liver in men with and without androgenetic alopecia.

METHODS: In this cross-sectional study, 140 men aged 25 to 55 years (70 men in two groups of men with and without androgenetic alopecia), who referred to the dermatology clinic for cosmetic reasons, volunteered to participate in the study. Age, body mass index, abdominal circumference, smoking history, extent of hair loss and liver ultrasound results were evaluated and compared in the two groups.

FINDINGS: The mean age of participants was 35.84±7.90 years. There was no statistically significant difference between the two groups in terms of age, smoking, and abdominal circumference. 54 men with androgenetic alopecia (77.1%) had fatty liver, while 41 people in the group without androgenetic alopecia (58.6%) had fatty liver, which showed a significant difference (p=0.019). Grade one and three fatty liver was significantly higher in patients with androgenetic alopecia compared to the group without androgenetic alopecia (p=0.011). There was no statistically significant relationship between the grade of fatty liver and the extent of androgenetic alopecia (p=0.059), but the extent of hair loss in obese individuals was significantly higher (p<0.001).

CONCLUSION: According to the findings of this study, fatty liver disease has a significant frequency in men with androgenetic alopecia.

KEY WORDS: *Fatty Liver, Male Pattern Baldness, Sonic Imaging*.

Please cite this article as follows:

Fallah Arzpeyma S, Rafiei R, Zamani S, Rafiei E. Comparison of Fatty Liver Disease in Men with and without Androgenetic Alopecia. J Babol Univ Med Sci. 2021; 23: 98-104.

***Corresponding Author: R. Rafiei (MD)**
Address: Department of Dermatology, School of Medicine, Guilan University of Medical Sciences, Rasht, I.R.Iran
Tel: +98 13 3541002
E-mail: rafieirana@yahoo.com

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

Introduction

Non-alcoholic fatty liver disease is the most common chronic liver disorder affecting a quarter of the world's population (1, 2). Fatty liver is a metabolic disease in which the most important associated risk factor is insulin resistance due to obesity and diabetes (3). Other causes of fatty liver include hyperlipidemia, medications, pregnancy, total parenteral nutrition, severe hepatitis, and storage diseases. Recently, fatty liver has become very important as part of the metabolic syndrome (4).

Androgenetic alopecia (male pattern hair loss) is the most common type of hereditary hair loss. About half of men experience it by the age of 50, and more than 70% experience it at higher ages. The location of hair loss, the age of onset and its severity vary from person to person (5, 6). The follicles of susceptible hair are thought to be targeted by androgenic hormones, and in the affected areas, thick hair is gradually replaced by thin hair (7).

Androgenetic alopecia is associated with cardiovascular disease, hypertension, prostate cancer, obesity and insulin resistance, and smoking (8-11). Metabolic syndrome is also a category of metabolic disorders, such as insulin resistance, obesity and diabetes. Some studies in women show polycystic ovary syndrome, hair loss, and fatty liver (12-17). However, despite significant evidence of common risk factors for fatty liver and androgenetic alopecia in men, few studies have been found that clearly show the association between fatty liver and androgenetic alopecia in men. If this association is confirmed, early examination of men with androgenetic alopecia for fatty liver may be necessary. Therefore, the aim of this study was to compare the frequency of fatty liver in men with and without androgenetic alopecia.

Methods

This cross-sectional study was approved by the ethics committee of Guilan University of Medical Sciences with the code IR.GUMS.REC.1397.328. After obtaining informed written consent from men aged 25 to 55 years who referred to the dermatology clinic of Razi Hospital in Rasht in 2018 due to cosmetic complaints such as mole removal, blemishes, hair loss, etc., they were included in the study. After matching the subjects based on age groups (±5 years), subjects in both groups of with and without hair loss were compared. Participants' characteristics including age, smoking history, body mass index (BMI), abdominal circumference, androgenetic alopecia and its grade based on Bouhanna's classification (Figure 1) (11) and sonographic findings in terms of changes in fatty liver and its severity were recorded in the data collection form.

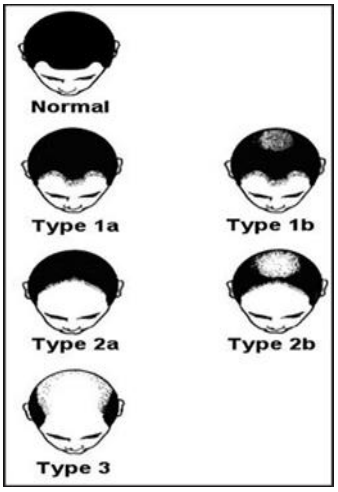

Figure 1. hair loss based on Bouhanna's classification (11)

Men under topical and oral treatments for hair loss, a history of alcohol use, previously known liver disease, or vague ultrasound results were excluded. Body mass index in terms of kg/m2 was assessed based on three categories: normal (18.5-24.9), overweight (25.9-29) and obesity (≤30) (18). Ultrasound was performed by a single device (Toshiba Aplio 300 ultrasound system, Japan, by B mode method, transducer 5 to 7 MHz frequency) by an experienced sonographer. Evaluation was performed after 6 hours of fasting with real time ultrasound in both supine and right anterior view of the upper abdomen. The classification of fatty liver is as follows:

Mild (grade 1): Slight increase in hepatic echogenicity with the ability to see the diaphragm and the margin of the intrahepatic artery normally

Moderate (grade 2): Moderate increase in hepatic echogenicity with brief defects in intrahepatic vessels and diaphragm

Severe (grade 3): Significant increase in echogenicity with poor penetration into the posterior parts of the right lobe of the liver and no or poor visibility of the diaphragm and hepatic vessels (12).

Due to the lack of a completely similar study, the sample size required to assess the association between fatty liver and alopecia was determined 70 people in each group with 95% confidence (significance level of

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

5%) and test power of 80% and based on the results of the pilot study.

Data analysis: Data were analyzed using SPSS 18 software. Median (minimum-maximum) was used to describe quantitative variables with abnormal distribution and quantitative and percentage variables were used to describe qualitative variables. The non-parametric Mann-Whitney test was used to compare quantitative variables with abnormal distribution in the studied subgroups. Chi Square Test and Fisher's Exact Test were used to compare the qualitative variables and $p<0.05$ was considered significant.

Results

In the present study, 140 individuals with a mean age of 35.84±7.90 years and an age range of 25-55 years in two groups of with and without androgenetic alopecia (70 people in each group) were studied. There was no significant difference in age, body mass index and abdominal circumference between the two groups of with and without androgenetic alopecia. There was no difference between the two groups in terms of smoking, even in men under 35 years of age. Obesity (BMI≥30) in patients with androgenetic alopecia and overweight (BMI: 25.9-29) in people without androgenetic alopecia was significantly higher ($p<0.001$) (Table 1).

In patients with androgenetic alopecia, 54 people (77.1%) had fatty liver, while in the group without androgenetic alopecia, 41 people (58.6%) had fatty liver. Therefore, the frequency of fatty liver in patients with androgenetic alopecia was higher than the group without androgenetic alopecia and this difference was significant ($p=0.019$). Based on the results, first and third grade fatty liver was higher in patients with androgenetic alopecia compared to the group without androgenetic alopecia and this difference was statistically significant ($p=0.011$) (Table 2).

The extent of hair loss in patients with androgenetic alopecia was based on Bouhanna classification: grades 1a, 1b, 2b and 3 were respectively observed 30, 20, 14.3 and 35.7% of patients. There was no statistically significant relationship between the grade of fatty liver and the extent of androgenetic alopecia ($p=0.059$) (Table 3), but the extent of hair loss in obese people was significantly higher ($p<0.001$) (Table 4).

Table 1. Comparison of demographic characteristics in groups with and without androgenetic alopecia

Variable	Median (minimum-maximum) or number(%) Without androgenetic alopecia (n=70)	With androgenetic alopecia (n=70)	Total (n=140)	p-value
Age (years), Median (Minimum- Maximum)	33.50 (25.00-50.00)	34.00 (25.00-50.00)	34.00 (25.00-50.00)	0.960*
Age group (year)				
25-29	18(50.0)	18(50.0)	36(25.7)	
30-34	19(50.0)	19(50.0)	38(27.1)	
35-39	7(50.0)	7(50.0)	14(10.0)	>0.999**
40-44	13(50.0)	13(50.0)	26(18.6)	
45-49	7(50.0)	7(50.0)	14(10.0)	
50-54	6(50.0)	6(50.0)	12(8.6)	
Smoking				
NO	31(46.3)	36(53.7)	67(47.9)	0.398**
Yes	39(53.4)	34(46.6)	73(52.1)	
body mass index (kg/m^2)				
Normal (18.5-24.9)	21(46.7)	24(53.3)	45(32.1)	<0.001**
Overweight (25.9-29)	47(65.3)	25(34.7)	72(51.4)	
Obese (30≤)	2(8.7)	21(91.3)	23(16.4)	
Abdominal circumference (cm), median (minimum-maximum)	103.00 (82.00-121.00)	102.50 (82.00-124.00)	103.00 (82.00-124.00)	0.732*

*Mann Whitney Test, **Chi Square

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

Table 2. Comparison of the frequency of fatty liver grading in men with and without androgenetic alopecia

Study groups	Fatty liver grading 0 Number(%)	1 Number(%)	2 Number(%)	3 Number(%)	Total (n=140) Number (%)	p-value*
Without androgenetic alopecia	29(41.4)	21(30.0)	20(28.6)	0(0)	70(50)	0.011
With androgenetic alopecia	16(22.9)	33(47.1)	17(24.3)	4(5.7)	70(50)	0.011

*Fisher's Exact Test

Table 3. Evaluation of the relationship between fatty liver severity and the degree of androgenetic alopecia

Bouhanna score in patients with hair loss	Fatty liver grading 0 Number(%)	1 Number(%)	2 Number(%)	3 Number(%)	Total (n=70) Number(%)	p-value*
1 a	6(28.6)	11(52.4)	3(14.3)	1(4.8)	21	0.059
2 a	4(28.6)	4(28.6)	6(42.9)	0(0)	14	0.059
2 b	2(20.0)	5(50.0)	2(20.0)	1(10.0)	10	0.059
3	4(16.0)	13(52.0)	6(24.0)	2(8.0)	25	0.059

*Fisher's Exact Test

Table 4. Comparison of the frequency of different levels of body mass index in men with androgenic alopecia according to the extent of hair loss

Body mass index (kg/m2)	1a & 1b Bouhanna score (n=35) Number(%)	2b & 3 Bouhanna score (n=35) Number(%)	Total (n=70) Number(%)	*p-value
18.5-24.9	17(70.8)	7(29.2)	24(34.3)	<0.001
25-29.9	16(64.0)	9(36.0)	25(35.7)	<0.001
≥30	2(9.5)	19(90.5)	21(30.0)	<0.001

*Chi Square Test

Discussion

In our study, the frequency of fatty liver in men with androgenetic alopecia was significantly higher than the group without alopecia. However, there was no statistically significant relationship between the grade of fatty liver and the extent of androgenetic alopecia. Fatty liver is a metabolic disorder associated with obesity and hyperlipidemia (3, 12). On the other hand, several studies have been performed on the association between androgenetic alopecia and metabolic syndrome (14-20). With the increase in age, the risk of various clinical forms of metabolic syndrome and hair loss increases. Therefore, this question arises: is the association between androgenetic hair loss and the incidence of cardiovascular disease, hyperlipidemia and hypertension merely an aging-related process, or common genes play a role in the development of these features, especially in younger people (19-20). Bakry et al. found that people with androgenetic alopecia were 43% more associated with metabolic syndrome compared to controls (16). On the other hand, the early onset of androgenetic alopecia is associated with metabolic syndrome and insulin resistance (14, 19, 22). In our study, the Bouhanna classification was used to assess the severity of hair loss, while Nasiri et al. used Hamilton's classification to examine the relationship between hyperlipidemia and the androgenetic alopecia with a grade higher than 3 in Hamilton classification. In that study, significant differences in serum lipid levels were observed between the two groups, and the vertex androgenetic alopecia was introduced as a clinical marker of hyperlipidemia (23). In a study by Agac et al., the androgenetic alopecia with a grade higher than 3 in the Hamilton classification in young men was reported to indicate a risk of heart disease (24). Ischemic changes secondary to stenosis in the arteries feeding the hair follicles and the arteries of the heart in the context of hyperlipidemia and diabetes may explain this. The process of developing fatty liver is also easily justified in the context of disorders caused by metabolic syndrome (21); so, in line with our research, the

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

association between androgenetic alopecia and fatty liver can be justified.

In our study, there was no statistically significant difference between the two groups in terms of smoking. This finding is in contrast to a study by Su et al., which linked the more severe cases of hair loss and the type of vertex alopecia in lower age groups to smoking. Evaluation of younger people in their study and the relationship between the exact amount of smoking and specific patterns of hair loss in this study justifies this issue, which was not included in our study (25). In the study of Trueb et al., there was an association between smoking and hair loss due to damage to hair follicle cells caused by cigarette smoke (26).

In our study, there was no statistically significant difference in the circumference of the abdomen between the two groups, but obesity was higher in the group with hair loss. In the study of Yang et al., the relationship between severe obesity and severe cases of alopecia was mentioned, but the relationship between fatty liver and different stages of androgenetic alopecia was not mentioned (27). Choosing younger people with higher hair loss, racial differences, and diet affects the metabolic status of individuals in different parts of the world, and this may explain some differences in research results. In general, based on the above studies, the role of common risk factors such as diabetes, hyperlipidemia and androgenic hormones in both fatty liver disease and androgenetic hair loss must to be considered. The role of ischemia secondary to atherosclerosis in hair follicles may play a role in hair loss (4, 20, 28).

Overall, in the present study, the association between androgenetic alopecia and fatty liver was statistically significant, but there were some limitations in our study that could affect the results. The sample size was small, which may not reflect the real characteristics of the community. Other limitations were study time, interpretive errors in ultrasound, not considering the age of onset of hair loss in participants, use of different age groups, not recording accurate medication history and underlying diseases, and accurate level of smoking. Therefore, designing a study with a larger sample size, especially in the younger age group, considering more advanced cases of hair loss at younger ages and recording other laboratory findings of patients is recommended to prove this relationship.

Conflict of interest: None.

Acknowledgment

We would like to thank the Vice Chancellor for Research and Technology of Guilan University of Medical Sciences and the esteemed staff of the sonography department of Razi Hospital and Dr. Kazemnejad, the second consultant in statistics.

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

References

1.Sharma L, Dubey A, Gupta PR, Agrawal A. Androgenetic alopecia and risk of coronary artery disease. Indian Dermatol Online J. 2013;4(4):283-7.

2.Hernaez R, Lazo M, Bonekamp S, Kamel I, Brancati FL, Guallar E, et al. Diagnostic accuracy and reliability of ultrasonography for the detection of fatty liver: a meta-analysis. Hepatology. 2011;54(3):1082-90.

3.Lonardo A, Ballestri S, Marchesini G, Angulo P, Loria P. Nonalcoholic fatty liver disease: a precursor of the metabolic syndrome. Dig Liver Dis. 2015;47(3):181-90.

4.Norwood OT. Male pattern baldness: classification and incidence. South Med J. 1975;68(11):1359-65.

5.Paus R, Muller-Rover S, Botchkarev VA. Chronobiology of the hair follicle: hunting the " hair cycle clock". J Investig Dermatol Symp Proc. 1999;4(3):338-45.

6.Hirsso P, Rajala U, Hiltunen L, Jokelainen J, Keinanen-Kiukaanniemi S, Nayha S. Obesity and low-grade inflammation among young Finnish men with early-onset alopecia. Dermatology. 2007;214(2):125-9.

7.Jaworsky C, Kligman AM, Murphy GF. Characterization of inflammatory infiltrates in male pattern alopecia: implications for pathogenesis. Br J Dermatol. 1992;127(3):239-46.

8.Randall VA, Thornton MJ, Messenger AG. Cultured dermal papilla cells from androgen-dependent human hair follicles (e.g. beard) contain more androgen receptors than those from non-balding areas of scalp. J Endocrinol. 1992;133(1):141-7.

9.Itami S, Kurata S, Takayasu S. Androgen induction of follicular epithelial cell growth is mediated via insulin-like growth factor-I from dermal papilla cells. Biochem Biophys Res Commun. 1995;212(3):988-94.

10.Laaksonen DE, Niskanen L, Punnonen K, Nyyssönen K, Tuomainen T-P, Valkonen V-P, et al. Testosterone and sex hormone-binding globulin predict the metabolic syndrome and diabetes in middle-aged men. Diabetes Care. 2004;27(5):1036-41.

11.Gupta M, Mysore V. Classifications of patterned hair loss: a review. J Cutan Aesthet Surg. 2016;9(1):3-12.

12.Icer S, Coskun A, Ikizceli T. Quantitative grading using Grey Relational Analysis on ultrasonographic images of a fatty liver. J Med Syst. 2012;36(4):2521-8.

13.Gopinath H, Upadya GM. Metabolic syndrome in androgenic alopecia. Indian J Dermatol Venereol Leprol. 2016;82(4):404-8.

14.Banger HS, Malhotra SK, Singh S, Mahajan M. Is Early Onset Androgenic Alopecia a Marker of Metabolic Syndrome and Carotid Artery Atherosclerosis in Young Indian Male Patients?. Int J Trichology. 2015;7(4):141-7.

15.Arias-Santiago S, Gutiérrez-Salmerón MT, Castellote-Caballero L, Buendía-Eisman A, Naranjo-Sintes R. Androgenetic alopecia and cardiovascular risk factors in men and women: A comparative study. J Am Acad Dermatol. 2010;63(3):420-9.

16.Bakry OA, Moneim Shoeib MA, El Shafiee MK, Hassan A. Androgenetic alopecia, metabolic syndrome, and insulin resistance: Is there any association? A case-control study. Indian Dermatol Online J. 2014;5(3):276-81.

17.Salva-Pastor N, Chávez-Tapia NC, Uribe M, Nuño-Lámbarri N. Understanding the Association of Polycystic Ovary Syndrome and Non-alcoholic Fatty Liver Disease. J Steroid Biochem Mol Biol. 2019;194:105445.

18.Nuttall FQ. Body mass index: obesity, BMI, and health: a critical review. Nutr Today. 2015;50(3):117-28.

19.Su L-H, Chen TH-H. Association of androgenetic alopecia with metabolic syndrome in men: a community-based survey. Br J Dermatol. 2010;163(2):371-7.

20.Ahouansou S, Le Toumelin P, Crickx B, Descamps V. Association of androgenetic alopecia and hypertension. Eur J Dermatol. 2007;17(3):220-2.

21.Hamaguchi M, Kojima T, Takeda N, Nakagawa T, Taniguchi H, Fujii K, et al. The metabolic syndrome as a predictor of nonalcoholic fatty liver disease. Ann Intern Med. 2005;143(10):722-8.

22.Matilainen V, Koskela P, Keinänen-Kiukaanniemi S. Early androgenetic alopecia as a marker of insulin resistance. Lancet. 2000;356(9236):1165-6.

23.Nasiri S, Taghavian Pour S, Sadiqha A. Association of androgenetic alopecia and hyperlipidemia. Iran J Dermatol. 2005;8(4): 266-71. [In Persian]

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]

24.Ağaç MT, Korkmaz L, Cetin M, Turan T, Akyüz AR, Erkan H, et al. Androgenic Alopecia is Associated with Increased Arterial Stiffness in Asymptomatic Young Adults. J Am Coll Cardiol. 2013;62(18 Supplement 2):C90-C1. Available from: https://www.sciencedirect.com/search?qs=Androgenic%20Alopecia%20is%20Associated%20with%20Increased%20Arterial%20Stiffness%20in%20Asymptomatic%20Young%20Adults&pub=Journal%20of%20the%20American%20College%20of%20Cardiology&cid=271027

25.Su L-H, Chen TH-H. Association of Androgenetic Alopecia With Smoking and Its Prevalence Among Asian Men: A Community-Based Survey. Arch Dermatol. 2007;143(11):1401-6.

26.Trüeb RM. Association between Smoking and Hair Loss: Another Opportunity for Health Education against Smoking?. Dermatology. 2003;206(3):189-91.

27.Yang C-C, Hsieh F-N, Lin L-Y, Hsu C-K, Sheu H-M, Chen W. Higher body mass index is associated with greater severity of alopecia in men with male-pattern androgenetic alopecia in Taiwan: A cross-sectional study. J Am Acad Dermatol. 2014;70(2):297-302.e1.

28.Schwingel PA, Cotrim HP, Salles BR, Almeida CE, Ribeiro dos Santos Jr C, Nachef B, et al. Anabolic-androgenic steroids: A possible new risk factor of toxicant-associated fatty liver disease. Liver Int. 2011;31(3):348-53.

[DOR: 20.1001.1.15614107.1400.23.1.15.4]
[DOI: 10.22088/jbums.23.1.98]