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Hair pulling in a sample of Turkish university students: prevalence, clinical characteristics, predictors, and sex differences

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Abstract

To examine the prevalence of trichotillomania (TTM) and associated factors in a large non-clinical sample of Turkish university students. The population of the study comprised 862 university students, 596 (69.1%) females and 266 (30.9%) males, aged between 18 and 29 (21.3 ± 1.8) years. In addition to a sociodemographic form, the participants completed the Massachusetts General Hospital Hairpulling Scale and the Brief Symptom Inventory, and the Structured Interview Form based on the DSM 5 criteria for TTM. In the study, lifetime hair-pulling behavior was found in 18.9% of university students, current hair-pulling behavior was found in 10%, and a current diagnosis of TTM was found in 2.3%. The ratio of men to women among those diagnosed as having TTM was determined to be 1.8:1. Women mentioned more stressors that triggered hair-pulling behavior than men. Women showed hair-pulling behavior to reduce tension, whereas men reported that they experienced more pleasure sensations during hair-pulling. Finally, it was determined that those who met the TTM diagnostic criteria showed more persistent pulling patterns, felt more regret, and social avoidance, attempted to camouflage more, and thought their behavior was more likely to be a psychiatric illness than those who did not meet the TTM diagnostic criteria. Unlike the literature, the prevalence of TTM in Turkish university students was found to be almost equal in men and women, but it was determined that the hair-pulling patterns of men and women differed. Therefore, it is thought that rather than sex being a risk factor for TTM, it may differentiate approaches of men and women to hair-pulling and help-seeking behaviors.

Keywords Trichotillomania · Prevalence · Sex · Hair-pulling patterns

Introduction

Trichotillomania (TTM) is a psychiatric condition conceptualized as a body-focused repetitive behavior disorder characterized by repetitive hair pulling, causing significant hair loss. In the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), TTM is defined as recurrent hair pulling that results in hair loss and is not better explained by a medical condition (e.g., dermatologic problems) or another psychiatric disorder (e.g., psychotic disorder) (APA, 2013). TTM is included in the category "Obsessive-compulsive and related disorders" in DSM-5 (APA, 2013). Obsessive and compulsive and related disorders (OCRDs) are symptomatically related in that they are characterized by repetitive thoughts and behaviors and difficulty inhibiting the behaviors (APA, 2013).

Hair pulling behavior varies on a continuum from unnoticeable and unobtrusive to disfiguring. (Duke et al.., 2010; Grant, 2019). It is known that hair pulling behavior has a prevalence of 6.5–15% in studies conducted with non-clinical samples (Duke et al., 2009; Houghton et al., 2018; Siddiqui et al., 2012; Stanley et al., 1994). When diagnostic criteria are taken into account, the prevalence of TTM decreases to 0.7–3.5% (Christenson et al., 1991; Grzesiak et al., 2017; Grant et al., 2020; Mikhael et al., 2022; Snorrason et al., 2023; Solley and Turner 2018). Apart from the

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different results due to the heterogeneity in the methodology of previous studies, the true prevalence of TTM cannot be known because people camouflage the areas they pull due to their concerns about their appearance (Gawłowska-Sawosz et al., 2016; Flannery et al., 2023). However, in a recent meta-analysis study, it was reported that the prevalence of hair pulling behavior was 12.3% and TTM was 1.3% (Thomson et al., 2022).

The disease is generally observed to begin in early adolescence (ages 10–13) and late adolescence (Duke et al., 2009; Grant et al., 2020; Ricketts et al., 2019). Although the disorder occurs equally frequently in boys and girls during childhood, it is noted that its frequency increases in women as they age. Additionally, studies show that the prevalence of TTM is equal among men and women in community samples (Grant et al., 2020), while it is more prevalent among women in clinical samples (Aydin et al., 2021; Comertoglu Arslan et al., 2023; Grant & Chamberlain, 2016).

The dominance of female sex in previous studies conducted has brought a certain limitation when examining the phenomenology of pulling behavior. In some studies, it has been mentioned that women show more affective states such as tension and sadness before hair pulling, and that the accompanying comorbidities are different in men and women (Duke et al., 2009; Ghisi et al., 2013; Panza et al., 2013). Although there are some clues that female patients with TTM may show clinically different characteristics to men, there are not enough studies focusing specifically on this issue.

There are various characteristic features related to hair-pulling behavior. Hair pulling behavior usually occurs in more than one episode per day, and more than one area is usually pulled. Although hair from any part of the body is a potential target, scalp is most frequently pulled. Although eyebrows and eyelashes were reported as the other pulled areas, respectively, (Aydin et al. 2021; Barber et al., 2024; Woods & Houghton, 2014), some studies also reported different areas such as the pubic area and legs (Bottesi et al., 2016). Patients usually inspect the hairs to be pulled or visually scan the targeted area before pulling begins. They look for certain characteristics in the hair to pull it. Broken, bent, short, gray or newly grown may be the reason for pulling. Individuals with TTM generally avoid pulling hair in social situations, such as when they are alone, during sedentary activities (e.g., studying, watching television, lying in bed, reading a book) or in certain environments (such as the bedroom, bathroom) or certain emotional situations (e.g., with boredom, they may start venting anger or anxiety) (Barber et al., 2024; Duke, et al.,2010; Hicks et al., 2023; Stanley et al., 1994; Woods & Houghton, 2014). Pulled hairs are usually thrown away, but some patients ritualistically play with the removed hairs, and bite or swallow them (Grant & Odlaug, 2008; Snorrason et al., 2021)

A significant portion of patients report emotional changes associated with hair-pulling behavior. These patients report feeling increasing tension before or while trying to resist hair-pulling, and generally experiencing pleasure or relief after pulling their hair (Bottesi et al., 2016; Hicks et al., 2023; Flessner et al., 2008). Therefore, the relief and decrease in anxiety that occurs as a result of hair pulling acts as a positive reinforcer in the continuation of hair pulling behavior. However, in the long term, the repetitive nature of the behavior leads to negative consequences. These negative consequences generally develop in relation to the time spent on hair-pulling behavior and hair loss. The deterioration in the appearance of patients caused by hair loss causes embarrassment and a decrease in self-esteem. In addition, hair pulling causes patients to become withdrawn, social isolation, some difficulties in work, academic and social life, and a general decrease in the quality of life (Grant 2019; Woods et al., 2006; Woods & Houghton, 2014).

Although hair pulling behavior may show cultural and geographic differences, epidemiologic studies are mostly American. In Turkey, no study has been found examining the prevalence and clinical characteristics of hair pulling behavior in a non-clinical sample group. It is thought that revealing the phenomenologic features of hair pulling behavior will increase the diagnostic and clinical awareness of TTM and lay the groundwork for possible therapeutic interventions.

Taking into account the literature presented above, this study was conducted with two main objectives. Firstly, to determine the prevalence of TTM among university students in Turkey, who represent a non-clinical sample and are appropriate in terms of age of onset. Secondly, the aim was to establish information about the phenomenological background of hair-pulling behavior by identifying clinical characteristics predicting this behavior and examining gender differences.

Method

Design

In this study, cross-sectional data collection was utilized, therefore relational screening and comparison methods were employed. Additionally, descriptive analyses were included due to the epidemiological nature of the study.

Sample

Criteria for inclusion in the study were as follows: agreeing to participate in the study and being aged 18–30 years. Exclusion criteria from the study were inconsistent answers and being aged over 30 years. A total of 907 students were included in the study. Twenty-two participants were excluded from the data set due to inconsistent answers and 23 participants were excluded because they were aged over 30 years. The population comprised 862 university students, 596 (69.1%) females and 266 (30.9%) males, aged between 18 and 29 (21.3 ± 1.8) years. The participants of the study were reached through convenience sampling method among the students of the Department of Health Sciences, Hamidiye Life Sciences Psychology, at Istanbul University of Health Sciences in Turkey. Additionally, data was collected from the university student friends of these students, who are in the same or different university, through snowball sampling method. 5 points were added to the exam grades of the students who participated in the study.

Measures

Sociodemographic data form

The form included questions about participants' age, marital status, history of psychiatric, dermatologic and medical problems, smoking, and alcohol and psychoactive substance use.

Structured interview form

This form includes questions about the clinical features of the participants' hair pulling behavior (pulling sites, cause of pulling, triggers, awareness, pulling duration per day, number of episodes per day, age of onset, presence of stressors, pulling pattern, ritualistic behaviors after pulling, emotions before/during/after pulling, feelings of pain, and seeking help. It includes questions such as the need to camouflage, and whether it is considered a psychiatric disease/condition. In addition, each of the following diagnostic criteria for TTM is questioned according to the DSM-5: (A) Repeated pulling of my hair causing hair loss; (B) Repeated attempts to stop or decrease hair pulling; (C) Hair pulling is causing distress or causing difficulty in areas of my life (e.g., social interaction, health, school life, academic performance); (D) Realization that the hair pulling or hair loss was related to some other medical problem or a skin condition; (E) Realization that hair pulling or hair loss was related to another psychiatric disorder (other than TTM). Participant was accepted as having TTM when they answered "yes" to criteria A, B, and C and "no" to criteria D and E.

Massachusetts General Hospital hairpulling scale (MGH-HPS)

MGH-HPS is a five-point Likert-type self-report scale consisting of seven items. The scale, which asks questions about the previous week, consists of items measuring the frequency and intensity of the urge to pull, how much the desire to pull could be controlled, the frequency of the pulling behavior, how much resistance was shown against the pulling behavior, how much the pulling behavior could be controlled and the distress caused by the pulling behavior. The total score on the scale varies between 0 and 28. The MGH-HPS was developed by Keuthen et al. (1995) by using the items of the Yale-Brown Obsession Compulsion Scale (YBOCS) and validity and reliability studies were conducted. The Turkish validity and reliability study of the scale, which had a cut-off score of ≥ 9, was conducted by Aydin et al. (2023).

Brief symptom invantory (BSI)

The BSI, developed by Derogatis (1992) as a short form of the SCL-90-R scale, was created by selecting the 53 items of the SCL-90-R with the highest factor loadings. The Likert-type scale is scored between 0 and 4. Higher scores indicate a higher frequency of symptoms. The Turkish adaptation of the scale was conducted by Sahin and Durak (1994) with an adult sample. In this study, a five-factor structure consisting of anxiety, depression, negative self-concept, somatization, and hostility was obtained. The Cronbach's alpha coefficients of these factors vary between 0.75 and 0.87.

Procedure

For the study firstly was approved by the Ethics Committee of the University of Health Sciences (2022-22/534). Data collection was carried out between December 2022 and May 2023. Reached through convenience and snowball sampling, the university students carried out both group applications in classroom environments, and data was collected by hand from students. All students participated in the study voluntarily and each student signed is a voluntary consent form. Students who signed the voluntary consent form were asked to fill out structured scales containing questions. The self-report scales were to participants presented in two stages. Participants completed the MGH-HPS and BSI after demographic information, medical, skin, or psychiatric disease information, and smoking, alcohol, and substance use status in the first part. After the first part, the participants were asked "Have you ever pulled your hair now and/or in the past?" and those who answered "yes" to this question completed a second 30-item form. This

form by the researchers consists, of clinical features related to TTM and, DSM 5 diagnostic criteria. Participants who answered "no" to the question only answered the first part and took 7–8 min to complete it. However, for participants who answered "yes" to the question completion time of both documents was approximately 8–12 min.

Statistical analysis

The SPSS 26.0 for Windows program was used for statistical analysis. Descriptive statistics are given as numbers and percentages for categorical variables, and mean and standard deviation for numeric variables. Statistical analyses were performed on two groups. The first group consisted of the main data set of 862 students and the second group was the group that answered "yes" to the question, "Have you ever pulled your hair now and/or in the past?" Logistic regression analysis was performed to examine the variables that predicted hair pulling behavior, considering age, sex, medical history, smoking/alcohol use, psychiatric diagnosis, dermatologic disease, and BSI sub-dimensions as independent variables. Pearson's Chi-square test or Yates's correction or Fisher's exact test was used to determine differences between categorical variables in independent groups. Comparisons of numerical variables in independent groups were made using Student's t-test when normal distribution conditions were met, and the Mann-Whitney U test when normal distribution conditions were not met. Pearson's correlation analysis was performed for correlations between scales. The Cronbach's alpha coefficient of the MGH-HPS was 0.942 and the item-total correlation was in the range of 0.588–0.882. According to exploratory factor analysis, it was found that the unidimensional factor structure of the scale, which explained 75.1% of the variance, was appropriate ($\chi^2 = 5913.728$, $p < 0.001$) and item factor loadings were in the range of 0.672–0.916(Supplemental Table S1). According to receiver operating curve (ROC) analysis, when ≥ 10 was accepted as the cut-off point for MGH-HPS, TTM could be diagnosed with 75% sensitivity and 78% specificity (AUC = 0.795, 95% CI: [0.690–0.899]; $p < 0.001$) **(**Supplemental Table S2 and Fig. 1).

Results

Sample characteristics

The demographic and descriptive data of the participants and comparisons of groups are shown in Table 1. Of the participants, 845 (98%) were single and 14 (1.6%) were married. There were 207 (24%) students with no medical diagnoses, 277 (32.1%) with no dermatologic problems, 132 (15.8%) with a psychiatric diagnosis, 39 (4.5%) with obsessive-compulsive disorder (OCD), 11 (1.3%) with a diagnosis of TTM, 77 (8.9%) with depression, 116 (13.4%) had anxiety diagnoses, 239 (27.7%) were smokers, 242 (28.1%) were alcohol users, and lastly, 29 (3.4%) were substance users. The averages of the participants' clinical scale scores

Table 1 Sociodemographic and descriptive variables of participants and comparisons of groups

	In Total Sample ($n=862$)	Hair Puller ($n=163$)	Female Hair puller ($n=110$)	Male Hair Puller ($n=53$)	$t/\chi 2$	p	Not Meet TTM ($n=143$)	TTM ($n=20$)	$t/\chi 2$	p
Age	21.3 ± 1.8	21.1 ± 1.7	20.8 ± 1.4	21.3 ± 2.1	-1.632	0.107	20.9 ± 1.7	21.5 ± 1.6	-1.41	0.161
Sex, n(%)										
Female	596(69.1)	110(67.5)					99(69.2)	11(55)		
Male	266(30.9)	53(32.5)					44(30.8)	9(45)	1.036	0.309
Marital status, n(%)										
Single	845(98)	162(99.4)	110(100)	53(100)			143(100)	20(100)		
Married	14(1.6)									
Divorced	2(0.2)									
Dermatological problem, n(%)	277(32.1)	58(35.6)	47(43.9)	11(20.8)	7.262	**0.007**	52(37.1)	6(30)	0.139	0.709
Medical disease, n(%)	207[3]	41(25.2)	28(25.7)	13(24.5)	0	1	35(24.6)	6(30)	0.058	0.81
Psychiatric diagnosis (Yes)	132(15.3)	30(18.4)	24(21.8)	6[4]	1.972	0.16	28(19.6)	2(10)	-	0.374*
Depression	77(8.9)	22(13.5)	19(17.3)	3(5.7)	3.196	0.074	18(12.6)	4(20)	-	0.481*
Anxiety Disorder	116(13.4)	29(17.8)	25(22.7)	4(7.5)	4.645	0.031	24(16.8)	5(25)	-	0.359*
OCD	39(4.5)	9(5.5)	7(6.4)	2(3.8)	-	0.719*	8(5.6)	1(5)	-	1*
TTM	11(1.3)	10(6.1)	9(8.2)	1(1.9)	-	0.169*	6(4.2)	4(20)	-	**0.022***
Tobacco use, n(%)	239(27.7)	48(29.4)	21(19.1)	27(50.9)	15.97	**< 0.001**	44(30.8)	4(20)	0.53	0.467
Drug use	29(3.4)	5(3.1)	2(1.2)	3(5.7)	-	0.332*	4(2.8)	1(5)	fisher	0.489
Alcohol use	242(28.1)	46(28.2)	23(20.9)	23(43.4)	7.853	**0.005**	42(29.4)	4(20)	0.368	0.544

Abbreviation = *OCD*, Obsessive compulsive disorder; *TTM*, Trichotillomania

* Fisher exact test, boldface = statistical significant

and group comparisons are given in Supplemental Table S3. It was found the mean MGH-HPS score was 1.3 ± 3.7, the mean BSI-depression score was 20.7 ± 11.3, the mean BSI-anxiety score was 16.3 ± 10.9, the mean BSI-somatization score was 10.5 ± 7.3, the mean BSI-negative self-concept score was 15.8 ± 10.9, and the mean BSI-hostility score was 10.1 ± 6.2. Correlations between clinical scales are given in Supplemental Table S4. According to the correlation analysis performed on the entire sample, a weak correlation was found between the MGH-HPS and BSI subscales ($r = 0.156–0.187$, $p < 0.001$).

One hundred sixty-three (18.9%) students reported having hair-pulling behavior now or in the past. Of these, 86 (10%) stated that had currently had puller behaviors. Among the current hair pullers, 40 (46.5%) students answered "yes" to criterion A, 61 (70.9%) students answered "yes" to criterion B, 24 (27.9%) students answered "yes" to criterion C, five (5.8%) students answered yes to criterion D, and one (1.2%) student answered "yes" to criterion E. Thus, 20 (2.3%) students were found to have TTM after responding to the questionnaire based on the diagnostic criteria of the DSM-5 (Supplemental Table S5). Among the TTM respondents, there were nine males (3.4% of males recruited in the total sample) and 11 females (1.8% of females recruited in the total sample); therefore, the male-to-female ratio was 1.8:1. When the predictors of hair-pulling behavior in the general sample were examined using logistic regression analysis, age (B= -0.153, 95% CI: [0.765–0.963]; $p = 0.009$) and BSI-hostility scores (B = 0.082, 95% CI: [1.033–1.142]; $p = 0.001$) were found to be significant variables (Table 2).

Clinical features of hair-pulling behavior

Triggers, stressor factors, causes of hair-pulling behaviors, and comparisons are given in Table 3. Some 61.3% of those with hair-pulling behavior reported a triggering stressor factor. The initiating stressor factors were frequently stated as 'exam stress' (42.3%), 'domestic conflict/parental divorce' (19%), and 'conflict/separation in a romantic relationship' (9.2%). The answers to the question 'Why do you pull' were given as 'to reduce tension' (49.1%), 'habit' (25.2%), and 'reduce uncomfortable sensations (such as stinging, itching) at the roots of the hair' (12.9%). 'Mood changes (e.g., feeling sad/angry/anxious)' (35.6%), 'while doing work that requires concentration' (35%), and 'boredom' (22.7%) were also stated as triggering factors. Rates of pulling sites, onset, awareness, seeking help, and needing camouflage in lifetime hair pulling behavior are shown in Table 4. The age of onset was mostly reported to be 15 years and above (54%). Hair-pulling areas were frequently scalp (60.7%), eyebrow (25.2%), and beard (18.4%). The majority (79.1%) stated that they were mostly aware of their hair-pulling behavior, and 19.6% stated that they were mostly unaware of their behavior, 28.8% answered 'yes' to the question about needing to camouflage the area with hair loss, and 23.9% stated that hair-pulling behavior was a psychiatric disease/condition. Among those with hair-pulling behavior, 8% stated that they consulted a psychologist, 7.4% a dermatologist, 4.9% a family physician, and 3.1% a psychiatrist.

Table 2 Predictors of hair pulling behavior in the whole sample

Predicting factors	B	p	OR	95% C.I. for OR	
				Lower	Upper
Age	-0.153	**0.009**	0.858	0.765	0.963
Sex(Female)	-0.412	0.063	0.662	0.428	1.023
Medical disease(Yes)	0.062	0.781	1.064	0.686	1.652
Dermatological problem(Yes)	-0.275	0.171	0.759	0.512	1.126
Psychiatric diagnosis(Yes)	0.075	0.772	1.078	0.648	1.794
Tobacco use(Yes)	0.128	0.601	1.136	0.704	1.835
Alcohol use(Yes)	0.119	0.623	1.126	0.701	1.809
Drug Use(Yes)	0.189	0.736	1.209	0.401	3.643
BSI-anxiety	0.011	0.594	1.011	0.971	1.052
BSI-depression	-0.010	0.537	0.990	0.958	1.023
BSI-negative self-concept	0.002	0.909	1.002	0.968	1.037
BSI-somatization	0.030	0.150	1.030	0.989	1.072
BSI-hostility	0.082	**0.001**	1.086	1.033	1.142

Characteristics of current hair-pulling behavior

Those who currently had hair-pulling behavior stated that they had been hair-pulling for an average of 3.5 ± 3.4 years. The pattern of current hair-pulling behavior, its duration and number of episodes per day, and ritualistic behaviors and comparisons are shown in Supplemental Table S6. Some 67.4% of those who showed hair-pulling behavior stated that they usually pulled their hair when they were alone, and 27.9% stated that they usually pulled it when there was someone around. For the average time spent on hair-pulling behavior per day, 32.6% stated it as 1–5 min, 24.4% stated it as < 1 min and 16.3% stated it as 31–60 min. For the average frequency of hair pulling per day, 50% answered 1–3 times and 30.2% answered 4–10 times. Most (77.9%) stated that their hair-pulling behavior showed an intermittent pattern, and 14% said that their hair-pulling behavior was persistent. In response to the question "What do you do with the pulled hairs?", 40.7% answered "I throw them away", 26.7% said "I examine the structure of the hairs", and 23.3% answered, "I roll them between my fingers".

Pain perception and emotions experienced before during and after the current pulling behavior and comparisons are given in Supplemental Table S7. It was stated by 64% that they did not feel pain during the hair-pulling behavior; 34.9% stated that they felt pain. It was stated by 60.1% that there were feelings of mental/physical tension before the

Table 3 Triggers, stressor factors and causes of lifetime hair pulling behavior and comparisons

	Hair Puller ($n=163$)	Female ($n=110$)	Male ($n=53$)	$\chi 2$	p	Not Meet TTM ($n=143$)	TTM ($n=20$)	$t/\chi 2$	p
Causes of pulling behavior									
Reduce tension	80(49.1)	60(55.6)	20(37.7)	4.516	**0.034**	72(51.1)	8(40)	0.472	0.492
Habit	41(25.2)	27(25)	14(26.4)	0	0.999	35(24.8)	6(30)	0.05	0.823
Reducing uncomfortable sensations	21(12.9)	13(12)	8(15.4)	0.114	0.736	19(13.5)	2(10.5)	-	1*
Pleasure	11(6.7)	8(8.4)	3(5.7)	-	1*	7(5)	4(20)	-	**0.033***
Sexual arousal	2(1.2)	1(0.9)	1(1.9)	-	0.554*	2(1.4)	0		1
Triggers									
Emotional changes	58(35.6)	45(41.3)	13(25)	4.051	**0.044**	51(35.9)	7(38.8)	0	1
Requiring concentration	57(35)	38(34.9)	19(35.9)	0	1	48(33.8)	45	0.535	0.484
Boredom	37(22.7)	26(24.1)	11(21.6)	0.022	0.882	33(23.6)	4(21.6)	-	1*
Feel	28(17.2)	19(17.6)	9(17.3)	0	1	25(17.9)	3(15)	-	1*
Sedantary activity	26(16)	22(20.2)	4(7.5)	3.34	0.068	20(14.1)	6(30)	-	0.098*
Looking in the mirror	14(8.6)	9(8.3)	5(9.4)	-	0.774	11(7.7)	3(15)	-	0.385*
Insomnia/Tired	11(6.7)	6(5.5)	5(9.4)	-	0.342	11(7.7)	0	-	0.362*
Trying to fall asleep	7(4.39	5(4.7)	2(3.9)	-	1	5(3.6)	2(10.5)	-	0.201*
During menstrual periods	2(1.2)	2(1.8)		-	1	1(6.7)	1(5)	-	0.232*
Stressor factors in the first pulling, n(%)	100(61.3)	74(69.2)	26(49.1)	6.111	**0.013**	84(60)	16(80)	2.194	0.139
Exam stress/Lesson related distress	69(42.3)	49(55.1)	20(54.1)	0	1	60(56.1)	9(47.4)	0.205	0.651
Conflict within the family/Parents' divorce	31(19)	24(27)	7(18.9)	0.53	0.437	25(23.4)	6(31.6)	-	0.563*
Conflict/separation in romantic relationship	15(9.2)	8(9)	7(18.9)	-	0.136*	13(12.1)	2(10.5)	-	1*
Separation from family/loved one	8(4.9)	4(4.5)	4(10.8)	-	0.232*	7(6.5)	1(5.3)	-	1*
Moving	7(4.3)	6(6.7)	1(2.7)	-	0.672*	6(5.6)	1(5.3)	-	1*
Physical attack	4(2.5)	4(4.5)	0	-	0.35*	4(3.7)	0	-	1*
Onset of menstruation	3(1.8)	3(3.4)	0	-	0.556*	3(2.8)	0	-	1*
Serious illness or death of a family member	3(1.8)	3(3.4)	0	-	0.555*	1(0.8)	2(10.5)	-	0.059*
Traumatic accident	2(1.2)	1(1.1)	1(2.7)	-	0.503*	1(0.9)	1(5.3)	-	0.28*
Sexual abuse	1(0.6)	1(1.1)	0	-	1*	1(0.9)	0	-	1*

* Fisher exact test, boldface = statistical significant

pulling behavior. During the pulling behavior, 41.9% stated that they felt relief, 23.3% felt pleasure, and 15.1% felt satisfaction. After the pulling behavior, 43% stated that they did not experience anything, 26.7% felt regret, 16.3% felt anxiety, 3.5% felt social avoidance, and 5.8% felt shame.

Sex differences in hair-pulling behavior

A comparison of sociodemographic variables and descriptive data between men and women is given in Table 1. It was determined that women had more dermatologic problems than men ($\chi^2=7.262$, $p=0.007$). There was no difference between men and women in terms of age, general medical problems, depression, OCD, and TTM diagnoses ($p>0.05$). Women stated that they were diagnosed as having anxiety disorders more often than men ($\chi^2=4.645$, $p=0.031$). Men smoked more ($\chi^2=15.967$, $p<0.001$) and used more alcohol ($\chi^2=7.853$, $p=0.005$) than women. BSI-depression ($t=2.000$, $p=0.047$), BSI-anxiety ($t=2.326$, $p=0.021$), and BSI-somatization scores ($t=2.856$, $p=0.005$) were higher in women than in men. There was no difference between other BSI subscales and MGH-HPS scores between men and women ($p>0.05$) (Table 2).

The duration of pulling behavior was longer in women than in men ($t=2.506$, $p=0.014$). Women answered 'yes' more to the question, 'Are there any stressors that trigger first hair-pulling behavior?' ($\chi^2=6.111$, $p=0.013$). Women answered the question 'Why do you pull' as 'reducing tension' more than men ($\chi^2=4.516$, $p=0.034$). Women answered the question of 'triggering factors' as 'mood changes' more often than men ($\chi^2=4.051$, $p=0.044$) (Table 4). Women pulled more scalp areas than men ($\chi^2=13.321$, $p<0.001$), and men pulled beard areas more ($\chi^2=39.274$, $p<0.001$). How men and women camouflaged hair loss areas were significantly different (Fisher's exact test = 22.841, $p<0.001$) (Table 4). Men ate more of their pulled hair than women (Fisher's exact test, $p=0.041$) (Supplemental Table S6). During hair pulling, men felt more pleasure ($\chi^2=5.634$, $p=0.017$) (Supplemental Table S7). In terms of other clinical characteristics, there was no difference between the women and men ($p>0.05$).

Table 4 Pulling site, onset, awareness, seeking help and needing camouflage in the lifetime hair pulling behavior

	Hair Puller ($n=163$)	Female ($n=110$)	Male ($n=53$)	$\chi2$	p	Not Meet TTM ($n=143$)	TTM ($n=20$)	$t/\chi2$	p
Onset < 15 years	72(44.2)	51(47.2)	21(40.4)	0.663	0.415	69(44.7)	9(47.4)	0	1
≥15 years	88(54)	57(52.8)	31(59.6)			78(55.3)	10(52.6)		
Pulling Site, n(%)									
Scalp	99(60.7)	77(71.3)	22(41.5)	13.321	**< 0.001**	87(61.7)	12(60)	0	1
Eyebrows	41(25.2)	32(29.6)	9(17)	2.367	0.124	33(23.4)	8(40)	-	1*
Beard	30(18.4)	5(4.7)	25(47.2)	39.274	**< 0.001**	27(19.3)	3(15)	-	0.769*
Armpit	12(7.4)	10(9.3)	2(3.8)	-	0.34*	11(7.8)	1(5)	-	1*
Eyelashes	11(6.7)	6(5.6)	5(9.4)	-	0.507*	10(7.1)	1(5)	-	1*
Pubic	9(5.5)	6(5.6)	2(5.7)	-	1*	8(5.7)	1(5)	-	1*
Arm	3(1.8)	1(1.2)	2(4.3)	-	0.554*	3(2.7)	0	-	1*
Leg	2(1.2)	1(1.8)	1(2.4)	-	1*	2(2.3)	0	-	1*
Mostly aware(Yes)	129(79.1)	87(80.6)	42(79.2)	0	1	113(80.1)	16(80)	-	1*
Pschiatric condition/disease(Yes)	39(23.9)	30(27.8)	9(17)	1.708	0.191	26(18.4)	13(65)	-	**< 0.001***
Needing camouflage (Yes)	50(30.7)	29(58)	21(42)	2.48	0.115	35(25.5)	15(75)	19.797	**< 0.001**
With headband	1(0.6)	0	1(4.8)	22.841	**< 0.001***	0	1(6.7)	-	0.461*
Combing your hair in a certain direction	16(9.8)	11(37.9)	5(23.8)			12(34.3)	4(26.7)		
With headscarf	10(6.1)	9(31)	1(4.8)			7(20)	3(20)		
By cutting the beard	9(5.5)	0	9(42.9)			6(17.1)	3(20)		
By cutting hair short	2(1.2)	0	2(9.5)			2(5.7)	0		
With tattoo/make-up	5(3.1)	4(13.8)	1(4.8)			2(5.7)	3(20)		
Dressing long and modestly	7(4.3)	5(17.2)	1(9.5)			6(17.1)	1(6.7)		
Seeking help(Yes)	38(23.6)	20(18.5)	18(33.9)	0.953	0.329*	31(22.5)	7(35)	-	0.545*
Family doctor	8(4.9)	3(15)	5(27.8)	2.204	0.508	5(16.1)	3(42.9)	-	0.226*
Dermatologist	12(7.4)	6(30)	6(33.8)			9(29)	38(42.9)		
Psychiatrist	5(3.1)	4(20)	1(5.6)			5(16.1)	0		
Psychologist	13(8)	7(35)	6(33.3)			12(38.7)	1(14.3)		

*Fisher exact test, boldface = statistical significant

Differences between with TTM and without a diagnosis of TTM

There was no difference between those with TTM and those who did not meet the diagnosis of TTM in terms of age, sex, general medical problem, and diagnoses other than TTM ($p>0.05$). In patients with TTM, TTM diagnosis reporting was higher (Fisher's exact test, p = 0.022) (Table 1). Those diagnosed as having TTM had hair-pulling behavior for an average of 4.2 ± 3.4 years, and those without a diagnosis had hair-pulling behavior for an average of 3.7 ± 3.3 years, and there was no significant difference between them (Z= -0.420, p = 0.675). There was a significant difference in MGH-HP scores between those with and without TTM, in favor of those with TTM (t= -5.243, $p<0.001$), but there was no difference in BSI-subscale scores (Table 2). Those who received the diagnosis answered 'pleasure' more to the question 'why do you pull' than those who did not (Fisher's exact test, $p=0.033$) (Table 3). Those diagnosed reported that they saw their pulling behavior more as a psychiatric condition/disease (Fisher's exact test, $p<0.001$) and that they felt a greater need to camouflage ($\chi^2=19.797$, $p<0.001$) (Table 4).

It was found that the pulling behavior patterns of patients diagnosed TTM were persistent (Fisher's exact test, $p=0.022$), the pulling duration was longer (Fisher's exact test, $p<0.001$), and the number of episodes (Fisher's exact test, $p<0.001$) was higher (Supplemental Table S6). Those diagnosed as having TTM stated that they experienced more social avoidance (Fisher's exact test, $p=0.011$) and regret ($\chi^2=5.699$, $p=0.017$) after pulling (Supplemental Table S7).

Discussion

This study examined the prevalence of TTM according to DSM-5 diagnostic criteria in Turkish university students, clinical features of hair pulling behavior, and differences in terms of sex. Although TTM has been defined as a disease since the time of Hippocrates, it was thought to be a rare disease due to the lack of epidemiologic and clinical studies,

and its place in diagnostic systems could not be fully determined for a long time. Contrary to this historical story, as revealed in this study, hair pulling behavior can be observed in a wide range in society as habitual, non-problematic as a subthreshold diagnosis, or TTM. In the current study, among university students, the rate of lifetime hair pulling behavior was 18.9%, and current hair pulling behavior was 10%; a current diagnosis of TTM was detected in 2.3% according to the questionnaire based on the diagnostic criteria of the DSM-5.

In a recent meta-analysis study, it was reported that the prevalence of any hair pulling behavior was approximately 12.3% and the prevalence of TTM was 1.3% (Thomson et al., 2022). In an epidemiologic study conducted with a large sample, it was revealed that TTM was more common in young adulthood (2.5%) than in older ages (Grant et al., 2020). In various studies conducted on university students, hair pulling behavior was reported at rates of 3.5–13.3% (Grzesiak et al., 2017; Houghton et al., 2018; Mansueto et al., 2007; Mikhael et al., 2022; Sidiqui et al., 2012) and the prevalence of TTM was 0.7–2.2% (Cristenson et al., 1991; Grzesiak et al., 2017; Houghton et al., 2018; Mikhael et al., 2022; Tamam et al., 2017). However, in studies, hair pulling behavior is questioned in various styles (e.g., repetitive hair pulling behavior, hair pulling behavior with hair loss, lifetime hair pulling behavior). TTM, on the other hand, was evaluated according to different diagnostic criteria (DSM-III, DSM-IV and DSM-5). Higher rates were detected in terms of both hair pulling behavior and TTM diagnostic criteria in our study, but the results appear to be compatible with the literature. In addition, epidemiologic studies are mostly of American origin and the fact that they are conducted in different ethnic structures and geographic regions may affect the differences. However, in a study conducted through face-to-face interviews with medical faculty students in Turkey according to DSM-IV diagnostic criteria, a lower rate than our findings was detected, the rate of current TTM diagnoses was found as 1.4% (Tamam et al., 2017). Criteria B and C in DSM-IV (tension before hair pulling and pleasure and relaxation during hair pulling, respectively) were removed from DSM-5 because they were only met by some patients and TTM was displaced from the impulse control disorder category. Therefore, higher rates may have been found in the current study due to the increased probability of diagnosis of conditions after DSM-5 that were previously subthreshold. On the other hand, because the current study was in the form of a survey, it may be possible that students felt more comfortable and reflected themselves better than in face-to-face interviews.

Although the prevalence of TTM in both sexes is equal in childhood, it is predominantly higher in women in adulthood. Studies found that the male-female ratio was 1:2 (Duke et al., 2009), 1:4 (Grant and Chamberlain, 2016) or even 1:10 (Christenson et al., 1994; Lochner et al., 2010). However, contrary to our knowledge, in a few previous studies conducted on a non-clinical sample and in a recent large-sample study ($n = 10.169$), it was reported that the prevalence rates in men and women were equal (Ghisi et al., 2013; Grant et al., 2020; Siddiqui et al., 2012). In our study, the ratio of men to women among those diagnosed as having TTM was found as 1.8:1. Interestingly, for the first time, a finding has emerged that hair pulling behavior is more common in men. Although it has been shown that women are more affected in clinical sample groups for TTM, it is possible to say that men and women are affected at similar rates in community samples. In addition, it is thought that its prevalence in men cannot be fully determined in clinical samples because women are more likely to seek clinical help. In this context, this finding is important because it shows that men are at risk at least as much as women, and perhaps more.

The dominance of female sex in studies has brought a certain limitation when examining the phenomenology of hair pulling behavior. Women and men may show different characteristics in terms of the location, triggers, affective states, and environmental cues. Similar to some other studies, it was found that the scalp in women and beard in men were frequent pulling areas (Barber et al., 2024; Ghisi et al., 2013; Mansueto et al., 2007). Although there are usually more than one pulling sites, the head is reported as a frequent pulling site due it to being exposed and in easy reach of the hands (hair, eyebrows, eyelashes, beard, moustache) (Aydin et al.,. 2021; Barber et al., 2024;Woods and Houghton, 2014). Different pulling sites have also been described (e.g., pubic area, leg, armpit) depending on environmental cues (such as being in the bathroom) and triggers (such as looking in the mirror, sedentary activities) or cultural habits (Barber et al., 2024; Bottesi et al., 2016; Ghisi et al., 2013; Hicks et al., 2023).

In addition, women mentioned more stressor factors at first pulling behavior than men. This may be due to different stress reactions (experiencing depression, frustration and anxiety) between the sexes. Several psychosocial stressors have been mentioned that cause hair pulling behavior to begin or exacerbate (Aydin et al., 2022a, 2022b). In the child and adolescent group, it has been emphasized that some familial reasons such as parental divorce, parental approach, and parental psychiatric disorders may be initiating factors for TTM and that the familial approach should be at the forefront in treatment (Walther et al., 2014). In an adult clinical sample, similar to the current study, stress factors such as exam stress and family conflict were frequently mentioned (Aydin et al., 2021). In particular, if there are stressors for some individuals, this factor should be taken

into consideration in the treatment process. In this context, dialectical behavioral therapy intervention, which prioritizes interpersonal effectiveness, emotional regulation and stress tolerance skills, may come to mind in the control of pulling behavior.

Female hair pullers were more likely to be diagnosed as having anxiety disorders than males; BSI-anxiety, depression, and somatization scores were found to be higher. Women answered the question 'why do you pull your hair' to relieve tension more than men. Additionally, women more often reported 'mood changes' as triggers for hair pulling behavior. On the other hand, men stated that they smoked and consumed alcohol more than women and that they experienced more pleasure sensations during hair pulling. There are few studies in the literature that examine hair pulling behavior in terms of sex differences. It was found that earlier onset (Lochner et al., 2010), comorbidity of anxiety and depression (Duke et al., 2009; Panza et al., 2013), ritualistic behaviors (Duke et al., 2009), and functional impairment (Panza et al., 2013) were higher in women; the rates of OCD and tic disorders were higher in men (Christenson et al., 1994; Lochner et al., 2010). In our findings, women were more likely to experience both precipitating stressful life events and psychological symptoms such as anxiety and mood disturbance. In a study, it was thought that hair pulling behavior in women was more related to negative emotional states and that its functioned as a means of self-regulation in situations of overstimulation (Ghisi et al., 2013).

In the current study, pulling behavior in men may have a pleasurable facet such as smoking and alcohol use. The higher ratio of smoking and alcohol use, fewer stress factors, and the pleasure sensations associated with pulling behavior in men may be related to their use of defense mechanisms of denial and reaction formation to stress. On the other hand, women may present to outpatient clinics and seek treatment more often because they are emotional hair pullers and have esthetic concerns. However, men may have sought treatment less because they were able to cover their hair loss by cutting their beards, or because there was social acceptance of baldness or hair loss, or because their hair pulling behavior was based on a reward-addiction cycle. All of these may explain the differences in sex ratios seen in TTM for clinical and community samples. It may also provide evidence that men seek treatment for TTM less frequently.

Increased hostility was found to be a predictor of hair pulling behavior in university students. In a parallel study, it was reported that patients with TTM had a general increase in the subscale scores of neuroticism and anger-hostility and a decrease in adjustment scores (Hagh-Shenas et al., 2015). It is known that individuals with hair pulling behavior have more interpersonal problems and describe themselves as cold, vindictive, oppressive, and authoritarian (Stemberger et al., 2000). In understanding the formation of pulling behavior, because it has some common points with self-mutilative behavior, it may be useful to look at the hostility model. According to this, when anger and hostility cannot be expressed openly, people turn it into self-mutilative behavior in two forms. First, unexpressed hostility gradually increases internal tension and anxiety, and this increased tension is reduced through self-mutilation. Secondly, anger that cannot be directed towards its main source is internalized and directed towards oneself, thus the person punishes themself (Ross 2004). Patients with TTM patients have been reported to have difficulties expressing emotions, negative cognitions related to anxiety, and that these factors affect the course of the illness. (Aydin et al., 2022a, 2022b; Demirci et al., 2022; Rufer et al., 2014). However, it should be noted that there are insufficient studies on hostility and anger expressions.

In our study, those who met TTM criteria answered the question "why do you pull your hair" with "pleasure" significantly more than those who did not. It was discussed previously in TTM that the lack of control over the behavior, repetitiveness despite its negative consequences, and the pleasure of the pulling behavior may be appropriate to considered as a behavioral addiction (Chamberlain et al., 2016). Additionally, the majority of those who did not meet TTM criteria had a pulling duration of less than 1 min, and among those who did not meet TTM criteria, no one reported pulling behavior for more than 1 h. The pulling duration of the majority of those who met the TTM criteria was found to be between 16 and 30 min per day and the maximum pulling duration was 1–3 h. Similarly, among African-American college students, most hair-pulling behaviors were reported to last less than 10 min (Mansueto et al., 2007). Each hair pulling episode is usually short, such as seconds to a few minutes, but the episodes can recur frequently during the day, and at the end of the day, patients can devote 1–3 h to pulling (O'Sullivan et al., 2000). In the current study, those who meet the TTM criteria showed persistent patterns, felt regret and social avoidance, needed to camouflage, and thought of their behavior as a psychiatric disorder more than those who did not. Similarly, in TTM, hair pulling is more severe and individuals experience more impairment in their functionality and have lower quality of life (Woods et al., 2006).

Around one-third (31%) of hair pullers in the current study needed to camouflage. They tried to camouflage respectively by combing their hair in a certain direction, wearing a headscarf, cutting their beards, wearing long and covered clothes, and having tattoos/make-up. In TTM, hair loss ultimately causes embarrassment, low self-esteem, and social avoidance. Patients generally state that they avoid daily activities, spend most of their time at home, have

difficulties in academic/business life, cannot go on vacation or establish intimacy, and use more alcohol/substances to relieve the negative emotions associated with hair pulling behavior. (Flessner et al., 2008; Woods et al., 2006). Accordingly, it is thought that features such as negative emotions (regret, guilt) accompanying hair pulling behavior, social avoidance, time spent on the behavior, and the need to camouflage hair loss may be guiding factors as to whether the behavior is pathologic. On the contrary, the consequences of hair pulling behavior other than TTM are generally not perceived negatively by individuals and are not considered as a problematic behavior.

The MGH-HPS distinguishes students who meet TTM criteria from hair pulling behavior. The cut-off point for MGH-HPS was determined as 10 and above (75% sensitivity, 78% specificity). Previously, the cut-off point was found as 9 in a clinical sample (Aydin et al., 2023). The sensitivity and specificity values may have been higher because a comparison was made between a clinical sample and healthy controls. In an online study, the cut-off point was found as 13 (Klosowska et al., 2023). However, although that study was better at distinguishing patients compared with our study, it was worse at distinguishing healthy individuals. Considering that people's hair pulling severity may fluctuate depending on triggers and stressors, MGH-HPS's evaluation of the acute period (the last week) is one of the points that may cause problems in distinguishing between patients and healthy individuals. Another point is that the questions in the MGH-HPS evaluate the pulling urge and behavior rather than global questions that would make a clearer distinction between patients and healthy individuals, such as the amount of hair loss, average daily hair pulling duration, and social avoidance. These reasons may cause the sensitivity and specificity of MGH-HPS to be lower in non-clinical samples.

There are some limitations in our study. First, because there were no face-to-face interviews and students answered the questions themselves, some questions might not be fully understood or misunderstood. Psychiatric diagnoses, in particular, should be evaluated by a psychiatrist through an interview. For example, because the expression 'hair loss' in diagnostic criteria A is not objective, some may perceive it as baldness, and some may perceive it as hair loss. Secondly, the psychiatric diagnoses of the individuals were formed through their retrospective recalls, and because they were not confirmed by system records, they were included entirely within the scope of their self-reports. Thirdly, data in the study collected quickly, easily, and economically through convenience sampling and snowball methods. However, the selection of participants based on the researcher's or participant's own initiative, i.e., non-probabilistically, may lead to bias. For example, among hair pullers, the rate of men was slightly higher than for women, which is not compatible with the literature, but may also be a finding showing that male sex is a risk factor. This issue may be clarified with new studies. Additionally, it is likely that students, given that the test in the study is two-staged, may be inclined to respond "No" in the first stage in order to complete the test more quickly. This situation may have led to an underestimation of the actual frequency of hair-pulling behavior or TTM. Finally, factors such as the questionnaire and scales being administered by lecturer and the condition that only those who complete the test receive an additional 5 points on their exam grade may have influenced students' motivation to answer truthfully, resulting in the concealment of symptoms and avoidance of answering accurately.

Therefore, it is difficult to claim that this method reflects the entire population; our results do not represent the general population. It is necessary to interpret our findings considering these limitations.

As a result, the prevalence of TTM in Turkish university students was found as 2.3% and was almost equal in men and women. It has been found that young age and hostility predict hair pulling behavior. It was also seen that women's hair pulling behavior might be related to stressors and emotional states. In addition, it was determined that features such as negative emotions (regret, guilt), social avoidance, time spent on the behavior, and the need to camouflage indicated whether the behavior was pathological. Examining differences between clinical and community samples in future studies may contribute to understanding the heterogeneous nature of the disease.

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Declarations

Declarations of interest None.

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