Prevalence and Perception of Gingival Recession and Associated Factors among Sample of Egyptian Dental Students: A Cross-Sectional Study

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Aim: This study aimed to determine the prevalence and perception of gingival recession (GR) among a sample of Egyptian dental students, identify the possible associated and predisposing factors of recession, and assess the extent and distribution of GR in that sample.

Materials and Methods: This cross-sectional study included 312 dental students from different Egyptian dental schools surveyed using an online questionnaire to assess their perception of GR and its possible risk factors. Sixty other Egyptian dental students were professionally examined at the Faculty of Dentistry Ain Shams University to evaluate the recession's prevalence, extent, and distribution.

Results: The percentage of surveyed dental students who perceived GR was 21.15%, mostly mild cases. While, clinical evaluation documented that 46.67% of dental students had a mild recession, mainly localized in lower teeth and of Type 1 (RT1). Factors like plaque/calculus, brushing habits, orthodontic appliance use, and smoking were associated with recession. Aesthetic concerns and pain were reported; females were more likely to perceive recession as an aesthetic issue and experienced pain, often linked to a thin gingival phenotype. Age did not significantly impact the prevalence or perception of recession. A family history of periodontal diseases was linked to GR in multiple sites.

Conclusion: The prevalence of GR in the clinically evaluated sample of dental students was higher than the perceived prevalence in surveyed samples indicating a high prevalence of GR among this cohort of dental students despite their low perception. GR was mostly associated with smoking, plaque, and calculus.

Keywords: Gingival recession. Prevalence. Perception. Risk factors. Dental students

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Introduction

Gingival recession (GR) is a muco-gingival defect characterized by the apical migration of the gingival margin beyond the cemento-enamel junction (CEJ). [1] GR can be localized or generalized. Clinically, it manifests as an increased length of the clinical crown, root surface caries, hypersensitivity, root abrasion or erosion, and a poor aesthetic appearance, especially when affecting the labial/buccal surface of anterior teeth and canines. [2, 3] It is commonly seen in individuals with both high and poor standards of oral hygiene and is a frequent clinical observation in dental practice. [4]

Smile esthetics is important because they affect how attractive and confident people feel. Factors like the position and color of teeth, gingival health, and how much gingiva shows when smiling all play a role. These factors are influenced by things like the shape of lips, gingival health, and whether there is GR. [5]

Gingival recession (GR) can result from various factors: local factors, periodontal disease, mechanical forces, iatrogenic factors, and anatomical factors. Local factors like plaque and calculus and periodontal disease involve bacteria and the immune response degrading tissue and bone, leading to GR. Mechanical forces, such as aggressive teeth-brushing, and occlusal trauma. Iatrogenic factors include orthodontic treatments and poorly designed dental restorations. Anatomical factors like bone dehiscence, frenal attachment, tooth position, and gingival morphology influence GR development, particularly in patients with thin periodontal biotypes and inadequate maintenance. [1,2]

Miller (1985) classified GR into four classes: Class I involves marginal tissue recession not reaching the MGJ, with no interdental bone or soft tissue loss. Class II indicates recession reaching or surpassing the MGJ without interdental loss. Class III and IV indicate recession extending beyond the MGJ with associated bone or soft tissue loss, [8] Marini et al. (2004) classified GR into mild ($\leq$ 3.0 mm exposure), moderate (3.0-4.0 mm exposure), and advanced (> 4.0 mm exposure) based on the root surface exposure. [9]

Cairo et al. (2011) classified GR into recession type 1 (RT1) (no interproximal attachment loss, allowing 100% root coverage), (RT2) (mild interproximal loss, with limitations in complete coverage), and (RT3) (advanced interproximal loss, precluding full coverage), each reflecting different root coverage predictability. [10]

Epidemiology studies how health-related issues spread and what causes them in specific populations, providing insights to establish effective treatments and preventive measures. [11] While correlations between findings in epidemiological studies do not prove cause and effect, they show relationships. [12] Many studies on gingival recession (GR) reported varying prevalence rates from 50% to 90% across populations, influenced by specific characteristics of each population. [13,14] Few studies have investigated the prevalence and perception of gingival recessions among the Egyptian population. This cross-sectional study aims to bridge the gap in knowledge regarding the prevalence, perception, awareness, and possible contributing factors of gingival recession among a sample of Egyptian dental students.

Material and methods
Study design

This observational, cross-sectional study involved 312 participants from various Egyptian dental schools through an online survey, and 60 dental students from Ain Shams University through clinical examination. The study aimed to determine the prevalence, perception, extent, severity, and potential factors associated with gingival recession among the participants. Only

consenting volunteers who met the inclusion and exclusion criteria were enrolled.

Approval to conduct this study was given by the Faculty of Dentistry, Ain Shams University Research Ethics Committee (FDASU-REC IR 112003).

Patient sample

Participants for the study were required to be Egyptian dental students, aged 18 to 26 years, of both genders, with both parents being Egyptian. They had to be in good health, able to comply with study criteria as determined by a review of systems and a health questionnaire and have at least 20 natural teeth. Excluded from the study were patients with active periodontitis (pocket depth > 5 mm and bleeding on probing in ≥ 10%) for clinically evaluated samples, patients with fixed or removable partial prosthesis, those with cleft lip or palate (for clinically evaluated samples), and patients needing prophylactic antibiotics for dental treatment (for surveyed and clinically evaluated samples).

Questionnaire design

A questionnaire was designed to assess the prevalence and perception of gingival recession and its associated factors among a sample of Egyptian dental students. The idea of the questionnaire was adapted from the online website *(Supplementary material 1)*: Perio Access (Gum Recession Analyzer)

The questionnaire, written in English, included a brief explanation of the study's purpose. The questions were divided into five sections: Section A: recorded demographic data such as nationality, dental student status, gender, university, age, and academic year. Section B: focused on oral hygiene measures (frequency of brushing, motion, and bristles type), general habits (like smoking), and the presence of orthodontic appliances. Section C: addressed family and dental history, including family history of periodontal diseases, and the presence of plaque or calculus. Section D: covered the presence and severity of gingival recession, assessed through photo selection. Section E: examined participants' perceptions of esthetic problems or pain.

Before distributing the survey, a pilot study was conducted with 10 students to assess the questionnaire's acceptability, clarity, and validity. The questionnaire was then transformed into a Google online form *(Supplementary material 2)* and the link was sent to the students in different dental schools in all years in the academic year 2022-2023.

Clinical assessment

A single expert examiner conducted the professional clinical assessment using professional instruments and a predesigned examination form for each of the 60 dental students (10 from each year).

1. Gingival Recession (REC) Examination:
- REC was measured as the distance between the gingival margin and the cementoenamel junction (CEJ) on the mid-buccal surface of each tooth.
- REC was classified according to Cairo's classification into RT1, RT2, and RT3 categories.
- Further classification was done based on Marini's classification to categorize the severity of root surface exposure into mild, moderate, and severe/advanced.

2. Site Assessment:
Gingival recession on the buccal surfaces of the upper and lower anterior teeth, premolars, and first molars was assessed using a UNC 15 periodontal probe, which was also used to measure the width of keratinized tissue. Gingival thickness at the recession site was evaluated with the transparency test. The level of frenum attachment was categorized as mucosal, gingival, papillary, or papillary penetration, and a pull test was conducted to assess the impact of high frenum attachment.

The presence of traumatic occlusion, such as edge-to-edge occlusion or crossbite, was determined by examining cuspal/incisal attrition and wear facets. Habits like tongue thrust and bruxism, the presence of orthodontic appliances, and history of previous orthodontic treatment were recorded. Local factors such as calculus, plaque, and gingival inflammation were checked, and a smoking history was taken from each participant. Participants discussed potential risk factors with the examiner and were asked about their intentions to modify these factors. Scaling was performed for participants with calculus.

Results
Statistical analysis

Categorical data were analyzed using Fisher's exact test and multiple z-tests with Bonferroni correction, presented as frequency and percentage values. Numerical data, shown as mean and standard deviation, were checked for normality with Shapiro-Wilk's test. Parametric data (age) were analyzed using an independent t-test, while non-parametric data (keratinized tissue width) were analyzed with Kruskal-Wallis's test. Correlations were examined using Spearman's rank-order correlation. A significance level of $p \leq 0.05$ was used. Statistical analysis was performed with R software version 4.2.3 for Windows.

Demographic characteristics

The online survey, conducted from November 2022 to November 2023, included 340 participants, with 28 excluded for not being Egyptian. Clinical evaluations were performed from June to September 2023 for 60 students at the Faculty of Dentistry, Ain Shams University.

The online survey included 312 students (98 males and 214 females) with a mean age of 22.15 ± 1.77 years, mostly interns from private universities. Clinically

evaluated were 60 dental students (27 males and 33 females), with a mean age of 21.77 ± 1.70 years, equally representing each academic year. Female participants were more prevalent in both groups.

Prevalence and GR characteristics

Descriptive characteristics of the GR prevalence data of the online surveyed participants are shown in Figure 1.
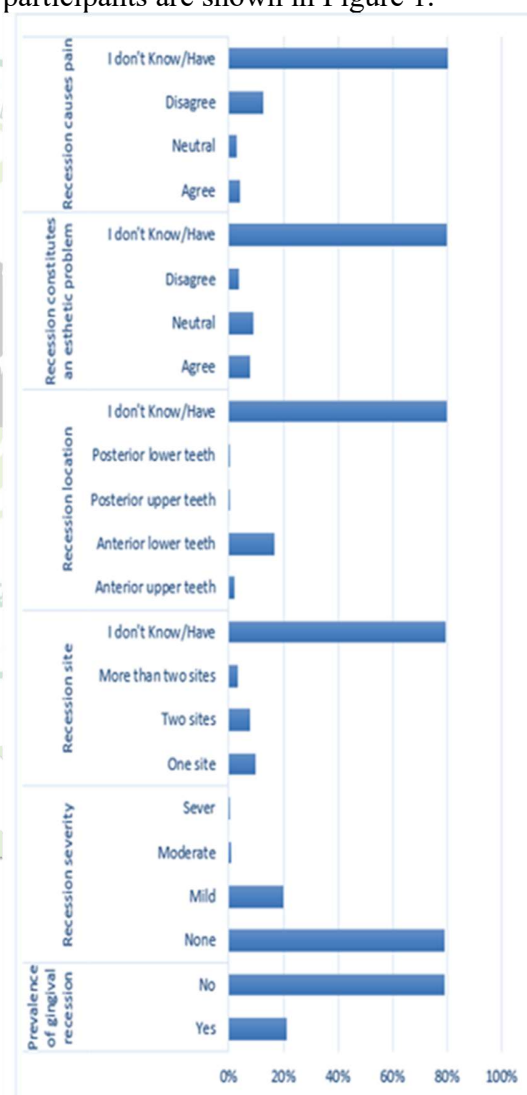

Figure 1: Bar chart showing gingival recession characteristics in online surveyed participants.

The prevalence rate was 21.15%. Most of them reported mild REC 93.93%,

few reported moderate 4.54% or severe 1.5% cases. Recession was reported in lower teeth by 78.78% and considered an aesthetic problem by 37.87%. Only 22.72% reported associated pain, with the majority either not experiencing these issues or being unaware of their condition.

Descriptive characteristics of the GR prevalence data of the clinically evaluated participants are shown in Figure 2.
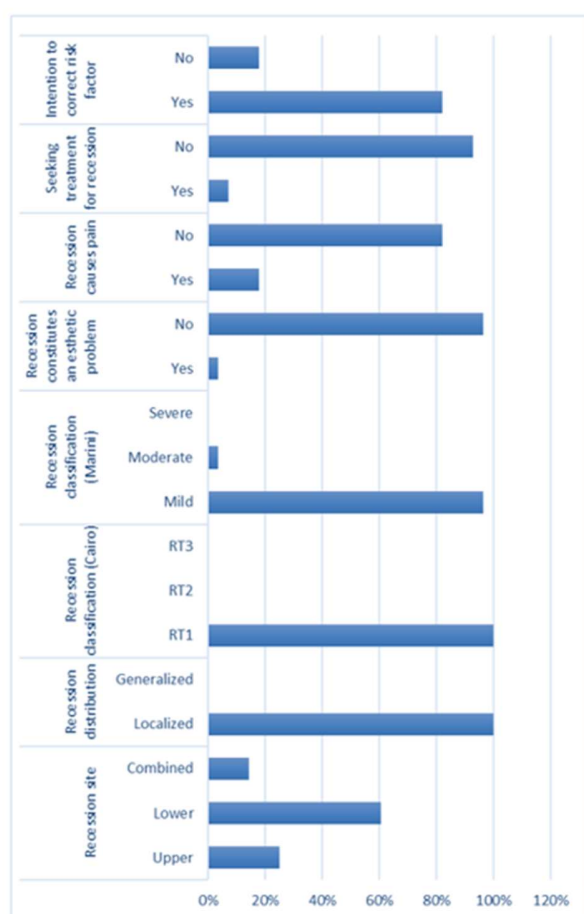

Figure 2: Bar chart showing gingival recession characteristics in clinically evaluated participants.

The overall prevalence of GR among students was 46.67%, predominantly in the lower teeth 60.71%, with all cases localized. According to the Cairo classification, all cases were RT1. The Marini classification showed most cases were mild 96.43%, with a

few moderate 3.57%, and none severe. Only 3.57% considered their recession an aesthetic issue, and 17.86% experienced pain. Few participants 7.14% sought treatment, but a significant majority 82.14% intended to address the risk factors.

GR prevalence and perception association with gender.

The association between gender and GR prevalence and perception in surveyed participants is reported in Table 1.

Table 1: Association between gender and gingival recession prevalence and perception in surveyed participants.

Parameter		[n (%)]		p-value
		Male	Female	
Prevalence of GR	Yes (n=66)	21 (31.81%)	45 (68.18%)	0.036*
	No (n=246)	77 (31.30%)	169 (68.67%)	
Recession constitutes an esthetic problem	Agree (n=25)	5 (20%)	20 (80%)	0.03*
	Neutral (n=29)	10 (34.48%)	19 (65.5%)	
	Disagree (n=12)	6 (50%)	6 (50%)	
	I don't Know/Have (n=246)	77 (31.3%)	169 (68.7%)	
Recession causes pain	Agree (n=15)	4 (26.6%)	11 (73.3%)	0.02*
	Neutral (n=10)	5 (50%)	5 (50%)	
	Disagree (n=41)	14 (34.14%)	27 (65.8%)	
	I don't Know/Have (n=246)	75 (30.48%)	171 (69.5%)	

*; significant (p<0.05) ns; non-significant (p>0.05)

The prevalence of GR was higher in females than males, with a statistically significant difference in GR perception between genders being higher in females. Furthermore, the percentage of females who agreed that recession constitutes an aesthetic

problem and causes pain was significantly higher.

The association between gender and GR prevalence and perception in clinically evaluated participants is reported in Table 2.

Table 2: Association between gender and gingival recession prevalence and perception in clinically evaluated participants.

Parameter		[n (%)]		p-value
		Male	Female	
Prevalence of GR	Yes (n=28)	10 (35.71%)	18 (64.28%)	0.046*
	No (n=32)	18 (56.25%)	14 (43.75%)	
Recession constitutes an esthetic problem	Yes (n=1)	0 (0.00%)	1 (100%)	0.005*
	No (n=27)	14 (51.8%)	13 (48.1%)	0.265*
Recession causes pain	Yes (n=5)	2 (40%)	3 (60%)	0.481ns
	No (n=23)	10 (43.47%)	13 (56.52%)	

*; significant (p<0.05) ns; non-significant (p>0.05)

There was a significant difference in the prevalence of GR between genders in clinically evaluated cases, The prevalence of GR was higher in females than males, also the only participant who thought gingival recession constituted an esthetic problem was a female student.

Association between age and GR are reported in Table 3.

Table 3: Association between age and gingival recession.

Parameter		Mean±SD (years)	p-value
Prevalence of GR (online survey)	Yes (n=66)	22.18±1.68	0.859ns
	No (n=246)	22.14±1.79	
Prevalence of GR (clinical evaluation)	Yes (n=28)	21.89±1.99	0.595ns
	No (n=32)	21.66±1.43	

*; significant (p<0.05) ns; non-significant (p>0.05)

There was a non-significant difference between age and GR in an online survey and in clinical evaluation, suggesting that age does not significantly affect the perception or prevalence of GR among these samples.

Risk factors

An analysis of GR risk factors in the online survey participants (n=312), revealed low percentages of orthodontic appliance use 10.9% and smoking 7.05%, the family history of periodontal disease was 12.82%, 45.51% of the respondents reported using medium or hard bristles, and 21.79% reported forceful teeth-brushing. Additionally, 33.33% of the respondents reported the presence of plaque or calculus (local factors).

An analysis of risk factors for GR in the clinically evaluated participants having GR (n=28), revealed that most of the examined cases had thin gingival biotype 53.57%, plaque and calculus, were a significant factor presented in 46.43% of participants. Moreover, forceful teeth brushing was found in 35.71% of cases. Traumatic occlusion was found in 10.71%, and habits like bruxism or previous trauma were also found in 10.71%. Additionally, previous orthodontic TTT has been found at 10.71%. Papillary/ gingival frenal attachment was noted in 7.14% of the cases, and only 3.57% had a family history of periodontal diseases, finally positive pull tests were rare and found at only 3.33% of the cases.

Risk factors associated with gender and age

There were significant associations between gender and both smoking (p<0.001*) and the presence of plaque or calculus (p=0.031*) in males, according to the online survey.

Additionally, there was a significant association between age and smoking, with smokers being significantly older than non-smokers (p<0.001*).

There was a significant association between gender and gingival biotype in the

clinically evaluated samples (p=0.008*), with a significantly higher percentage of females having a thin biotype 72.22% and a significantly higher percentage of males having a thick biotype 80%. In addition, there was also a significant association with plaque and calculus presence with a significantly higher percentage of males being affected (p=0.008*).

There was a significant association between traumatic occlusion (p<0.001*) and habitual bruxism (p=0.021*), in clinically evaluated cases with positive cases having significantly older age. For plaque and calculus presence, the association was also statistically significant, but with the younger age group being positive (p=0.007*).

In the online survey, there was a significant association between family history of periodontal diseases and recession sites with respondents with a positive family history of periodontal diseases having a significantly higher percentage of occurrences in more than two sites (p<0.001*).

There was a significant association between the number of recession sites in the clinically examined cases and the presence of orthodontic appliances, with more appliance users having recession in the upper arch (p=0.005*). Plaque presence was significantly associated with lower arch recession (p=0.006*).

Discussion

Most epidemiological data on dental and oral diseases come from studies outside the Arab world, indicating a lack of clear and reliable research in Arabian countries. [12]. Hence, the present work was designed and performed to establish a source of data regarding the prevalence, perception, and severity of GR, as well as, the associated risk factors of gingival recession in a sample of Egyptian dental students.

Establishing an effective surveying system is a crucial approach to controlling and preventing diseases, both in the present and the future. [15]

Surveying periodontal disease is traditionally challenging due to the need for clinical examinations and significant resource allocation. [16]

This cross-sectional study efficiently collected data from Egyptian dental students across different academic years using an online survey and clinical evaluations. This dual-method approach provided a comprehensive overview of gingival recession (GR) prevalence and risk factors by combining self-reported data with clinical assessments. The study used the Cairo et al. and Marini classifications during clinical evaluations, aiding in precise diagnosis and personalized treatment plans for GR, addressing both aesthetic and functional issues. This design was suitable for determining the prevalence, perception, extent, and distribution of GR, as well as identifying associated and predisposing factors.

There was a higher prevalence of females among the participants in both parts of the study, 68.59% in the online survey and 55% in clinical evaluation. That may be due to an increase in the number of female dental students in Egyptian colleges than males, and the assumed increase the female concern with aesthetic and dental care. This was following the study by Gandhi & Gandhi, (2021) where females represented 62.8% and with Hegab & Alnawawy, (2020). [15, 16]

In the online survey, the reported prevalence of GR was 21.15%, whereas in the clinical evaluation, GR prevalence was 46.6%. The higher prevalence in clinical evaluations suggests that participants in the online survey may have a lower perception of GR.

The perception results of the online survey correlate with the study by Nieri et al., (2013)

who found that out of 783 recessions, only 218 (28%) were perceived by the patient, while the majority of the lesions were not perceived. [4]

The results of the clinical evaluation part of the study, showing a 46.67% prevalence of (GR), correlate with findings by Romano et al., (2022), which reported a 40.90% prevalence of RT1 GR [2], also aligns with Müller et al., 2002 results, which found that 50% of young adults in Germany (19-30 years) suffered from GR [17], Additionally Fragkioudakis et al., (2021) reported 53.8% mean prevalence of GR. [18]

The online survey shows gingival recession (GR) rates of 31.81% for males and 68.18% for females, with a significant p-value (0.036*), indicating higher GR perception among females. In clinical evaluations, GR was 35.71% for males and 64.28% for females, with a significant p-value (0.064*), also indicating higher prevalence in females.

This correlates with Kozłowska et al., (2005), who found a female predilection for GR [19] also, Chrysanthakopoulos, (2011), found that 52.0% of females exhibited GR. [21] However, this contrasts with the findings of other studies all of which reported no statistically significant difference between males and females regarding gingival recession. [18 , 20, 22]

Interestingly, other studies showed a significant male predilection [13, 15, 16]. In the surveyed participants GR was seen as an aesthetic problem 37.87% or caused pain 22.72% in only a small portion of cases, with most respondents either not experiencing these issues or unaware of their condition. Similarly, in the clinical sample, few students considered recession an aesthetic problem 3.57% or experienced pain 17.86%. This obtained data was in contrast to Vignoletti et al., (2020) where more than 50% of the sample was aware of the problem. Almost all patients presenting symptomatology or

aesthetic concerns requested appropriate therapy. [23]

In the online survey, most affected cases had a recession in a single site (localized), primarily in the lower anterior teeth. Similarly, in the clinical evaluation, all positive cases had localized recession, mostly in the lower anterior teeth.

The results of both parts of the current study correlate with Georgieva, (2019), which stated that in young patients, (GR) is usually localized and mostly occurs in the lower arch [1]. Gandhi & Gandhi, (2021) and Hegab & Alnawawy, (2020) also found that the most commonly affected site for localized GR cases was the lower anterior teeth. [15, 16] Similarly, Dodwad, (2001) reported that about 87% of patients showed GR in the lower anterior area in his study. [25]

The lower anterior area is characterized by a thin gingival phenotype with nearly absent alveolar bone, which is easily impacted by risk factors like aggressive brushing with hard bristles, gingival inflammation, and orthodontic teeth movements outside the bony housing, this explains the high prevalence of GR in this region. [22]

Plaque/calculus was a significant factor found in 33.33% of surveyed participants and 46.43% of clinically evaluated cases, suggesting that they directly contribute to GR. This correlates with El Kholti et al., (2024) and Romano et al., (2022). Also Toker & Ozdemir, (2009) found that a high level of bacterial plaque was significantly associated with GR. [13, 2, 22]

There was a significant association between gender and plaque presence in surveyed participants (p=0.031*) and in clinically evaluated cases (p=0.008*), with a significantly higher percentage of males being affected. Likely due to known neglect of oral hygiene measures among males. Forceful teeth-brushing has been reported in 21.79% of surveyed participants and 35.71%

of clinically evaluated cases with 45.51% of the surveyed participants using medium or hard bristles, indicating it is an important predisposing factor for GR. This correlates with Seong et al. (2018), who stated that tooth brushing trauma triggers the onset and progression of non-inflammatory localized gingival recession. [27]

Additionally, Lafzi et al. (2009), found that brushing trauma was a significant etiological factor in GR observed in 42% of subjects [28]. It is advisable to educate patients on proper non-aggressive teeth-brushing methods. In clinically evaluated samples both traumatic occlusion and habits such as bruxism or previous trauma were present in 10.71% indicating a potential risk factor for GR, this correlates with De Souza et al., (2019), who stated that occlusal trauma is also an etiologic factor for GR. [29]

There was a significant association between traumatic occlusion and habitual bruxism in clinically evaluated cases, with positive cases being significantly older, likely due to the cumulative effects on the gingiva. Orthodontic appliances were found in 10.90% of surveyed participants and in 10.71% of clinically evaluated cases indicating that orthodontic treatment could influence gingival health, this finding is in agreement with Jati et al., (2016) [7], who stated that orthodontic treatment may place the affected teeth in conditions that serve as predisposing factors for GR, especially when the buccal bone plate is very thin or exhibits dehiscence. [7]

In clinically evaluated cases, a positive pull test was rare and found at only 3.33%. This correlates with Mythri et al., (2015), who found that frenal pull accounted for only 0.4% of the factors predisposing to GR. [30]

Similarly, Lafzi et al. (2009) reported an insignificant association between frenal attachment and GR. [28] A thin gingival biotype was found in 53.57% of clinically evaluated cases suggesting a higher susceptibility to GR

due to less protective tissue, this correlates with Lafzi et al., (2009), who identified the width and thickness of keratinized gingiva as etiological factors for gingival recession. [28]

There was a significant association between gender and thin gingival biotype in clinically evaluated cases, with more females 72.22% having a thin biotype (p=0.008*). This is in agreement with Abd-Allah et al., (2019) and with Shiva Manjunath et al., (2015) where most females showed thin gingival biotype than males. [31,32] While contrasts with Moosa et al., (2024), who found no significant gender-based disparity in gingival phenotypes among Pakistani young adults. [33] It also contrasts with Fischer et al., (2022), who found no significant differences between genders (p=0.722ns) in the prevalence of gingival phenotype. [34]

There was no significant age difference between cases with and without gingival recession in surveyed participants (p=0.859ns) or in clinically evaluated cases (p=0.595ns). This may be due to the small age range of the participants and their relatively young age where the mean age in the surveyed participants was (22.15±1.77) years and (21.77±1.70) years in the clinically evaluated cases. This is in agreement with Marini et al., (2004), who stated that the relationship between the occurrence of GR and age may probably be because of the longer period of exposure to the agents that cause gingival recession. [9]

Conclusion
1. The prevalence of GR was 46.67% in clinically evaluated samples compared to 21.15% of surveyed samples.
2. The majority of GR cases were mild, localized, and in lower anterior teeth.
3. A higher prevalence and perception of GR were among females and were associated with a higher percentage of thin gingival biotypes.

4. GR in males was associated with smoking and the presence of plaque and calculus.

5. A family history of periodontal diseases was associated with the occurrence of GR in more than one site, while orthodontic appliance was associated with recession in the upper arch.

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Data availability

Data are accessible from the corresponding author upon request.

Regulatory Statement

This study protocol was reviewed and approved by Faculty of Dentistry, Ain Shams University Research Ethics Committee (approval number FDASU-REC IR 112003).

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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