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Excessive Gingival Display, Prevalence, and Its Impact on Patient's Psychological Status and Quality of Life: A Questionnaire-Based Survey

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ABSTRACT

Background and objectives: Excessive gingival display, or "gummy smile," is a dental concern that affects psychological well-being and quality of life. This study aimed to determine the prevalence of Excessive gingival display and its impact on the psychological status and quality of life among adults in Sulaymaniyah, Kurdistan Region of Iraq.

Methods: A cross-sectional survey was conducted at the Shorsh Teaching Dental Center, from January to June 2023, using a convenience sample of 48 adults aged 18-45 from an initial 1000 patients. Excessive gingival display diagnosis was made via the lipstat technique, and the psychological impact was assessed with structured questionnaires on smile aesthetics and another adapted from Hills and Argyle.

Results: The prevalence of a gummy smile was 4.80%, with higher rates in women (6.43%) than men (2.29%), with a significant sex-based difference ($P \leq 0.001$). The total psychological score also showed a significant variation across age groups ($P \leq 0.03$), with a mean psychological score of 12 for the age group 22-28 years and 11 for the age group 29-34 years. This lower score in the older age group indicates a negative impact of Excessive gingival display and gummy smile on patients' psychological conditions. The self-perceived satisfaction score for the impact of Excessive gingival display and gummy smile on smile aesthetics and quality of life was not significant.

Conclusion: This study indicates excessive gingival display prevalence in females and younger individuals. Although QOL and smile aesthetics weren't greatly affected, early intervention may help reduce related psychological impacts in some patients.

Keywords: Gummy Smile, Prevalence, Psychology, Quality of Life**,** Smile

Introduction

The smile is a common human expression that serves as a reflection of many emotions. The smile is a crucial aesthetic element of the face and has a substantial influence on how people perceive our attractiveness and personality.[1] Excessive gingival display (EGD), sometimes known as a "gummy smile," is defined as the exposure of more than 3 mm of the upper gum tissue during a smile.[2] Approximately 10% of individuals aged 20 to 30 have an EGD. This condition is more often seen in women.[3]

The etiology of EGD is multifactorial, with several anatomical, developmental, and pathological factors contributing to its manifestation. These include altered passive eruption, short upper lip, hyperactive upper lip

elevator muscle, vertical maxillary excess, and dental malocclusions. Each of these factors can independently or in combination lead to the excessive display of gingival tissue.[3, 4] Although EGD is mostly a matter of appearance, it may result in considerable psychological anguish, diminished self-esteem, evasion of social circumstances, and perhaps depression.[5,6] A study by Jasser et al. showed that individuals with EGD may face significant social and psychological challenges due to perceptions of their smile, further emphasizing the need for interventions to address these concerns.[7]

Treatment for EGD depends on the underlying cause and the severity of the condition. Options range from conservative approaches like botulinum toxin injections to reduce hyperactivity of the upper lip muscles, to more invasive procedures such as orthodontic treatments, surgical lip repositioning, crown lengthening, or orthognathic surgery for skeletal discrepancies.[8] In addition, integrating patient-reported outcomes is necessary to provide a more comprehensive assessment of individuals' perspectives and reactions to medical interventions. Hence, assessing the oral health-related quality of life (OHRQoL) can complement normative measures.[9] Despite the existing body of research, several gaps remain in the literature regarding the comprehensive understanding of EGD's prevalence and its multifaceted impact on patients. Most studies have focused on the clinical and aesthetic aspects, with limited exploration into the psychological and quality-of-life dimensions. Additionally, there is a paucity of data specific to certain geographic regions and ethnic groups, which hinders the generalizability of findings.

Therefore, this study aimed to determine the prevalence of EGD and its impact on the patient's psychological condition and quality of life (QOL) in the City of Sulaymaniyah, Kurdistan Region of Iraq.

Patients and methods

This cross-sectional, questionnaire-based survey was conducted at the Shorsh Teaching Dental Center and Board Center in the City of Sulaymaniyah, Kurdistan Region of Iraq. The study spanned a period of six months, from January to June 2023.

Participants were selected using a convenience sampling method from individuals who visited the dental centers for various treatments. The initial pool consisted of approximately 1000 patients, from which a sample size of 48 individuals with EGD was finalized based on the inclusion and exclusion criteria.

Inclusion criteria were adults aged 18-45 years presenting with EGD and having informed consent, who had not undergone any periodontal surgery for lip repositioning and did not suffer from any pre-existing psychological conditions. Exclusion criteria included patients with debilitating diseases affecting routine oral hygiene practices or those outside the specified age range.

Data collection was conducted using a structured questionnaire divided into two sections. The first part of the questionnaire focused on participants' perceptions of their smile aesthetics and the quality of life (QOL) of EGD. This section included 12 questions, assessing satisfaction with the appearance, size, and visibility of teeth and gums during social interactions and daily activities. The question items were structured on a three-point Likert scale, providing options as 1=not satisfied, 2=moderately satisfied, and 3=completely satisfied.[10]

The second part of the questionnaire evaluated the broader psychological impacts of living with EGD, utilizing a set of 15 questions adapted from the work of Hills and Argyle. These questions were designed to measure overall well-being, interest in others, optimism about the future, and self-perception of attractiveness and satisfaction with life. Responses were recorded on a six-point scale ranging from 1=strongly disagree to 6=strongly agree, allowing for a detailed gauge of psychological health and social engagement.[11]

Diagnosis of EGD was based on clinical examination using the lipstat technique,[12] which involves a standard protocol for assessing the degree of gingival exposure during a full smile. Measurements of the gingival display were taken using a high-precision digital Vernier caliper (CDN 200), which records up to two decimal places. This instrument ensured accurate and repeatable measurements crucial for classifying the level of gingival display into

predefined categories (2-4 mm, 4-8 mm, and more than 8 mm).[13]

The study was approved by the Ethics Committee of the Kurdistan Higher Council of Medical Specialties. Informed consent was obtained from all participants after explaining the study's purpose, the confidentiality of their responses, and their right to withdraw at any time without any consequences. Data were handled and stored securely to maintain participant confidentiality.

Data were analyzed using SPSS software (IBM, Version 25). Descriptive statistics were used to summarize demographic and other categorical variables. Chi-square tests were employed to explore the relationship between categorical variables and the prevalence or impact of EGD. The significance level was set at $p \leq 0.05$ for all statistical tests.

Results

Among the 48 patients with EGD, 9 (18.75%) were male and 39 (81.25%) were female. The age distribution was 28 (58.33%) in the 22-28 age group and 20 (41.67%) in the 29-34 age group (Table 1).

Table (1): Distribution of demographic characteristics of patients with EGD

Variables		Frequency	%
Sex	Male	9	18.75%
	Female	39	81.25%
Age	22 - 28 Years	28	58.33%
	29 - 34 Years	20	41.67%
Total		48	100.00%

Statistical analysis showed significant differences in gingival appearance by sex ($P \leq 0.001$). In the classification of 2-4 mm, 25 (52.25%) were women, and in the 4-8 mm classification, 8 (16.75%) were men and 7 (14.5%) were women. In the more than 8 mm classification, 2% were men and 7 (14.5%) were women. Most women had EGD of 2-4 mm while most men had EGD of 4-8 mm (Table 2).

Table (2): Classification EGD by Gingival appearance

Gingival appearance	Sex		Total	p value**
	Male	Female		
2 – 4 mm	0	25 (52.25%) *	25 (52.25%)	< 0.001
4 – 8 mm	8 (16.75%)	7 (14.5%)	15 (31.25%)	
More than 8 mm	1 (2%)	7 (14.5%)	8 (16.5%)	
Total	9 (18.75%)	39 (81.25%)	48 (100%)	

* Frequency (Percent), **P-value Chi-Square

There was a statistically significant difference in total PS across age groups ($P \leq 0.03$), with averages of 12 for the 22-28 years group and 11 for the 29-34 years group (Figure 1).

Figure (1): Total psychological score in patients with EGD

Table (3) displays the total satisfaction scores for smile aesthetics based on sex, age group, and gingival appearance classification. The self-perceived satisfaction scores did not show statistically significant differences between sexes (P≤0.12), with 6 (66.7%) males and 15 (38.5%) females disagreeing with the impact of EGD on smile aesthetics and QOL. Similarly, no significant statistical differences were observed across age groups (P≤0.63). Regarding gingival appearance, no statistically significant differences were found (P≤0.07). In the classification of 2-4 mm, 7 (28%) disagreed and 18 (72%) agreed with the impact of EGD on smile aesthetics and QOL. In the 4-8 mm classification, 9 (60%) disagreed and 6 (40%) agreed, while in the classification of more than 8 mm, 5 (62.5%) disagreed and 3 (37.5%) agreed.

Table (3): Total score for satisfaction for smile aesthetics in patients with EGD

Variables		Total score for satisfaction			p value*
		Disagree (Score < 8) N (%)	Agree (Score 8-16) N (%)	Total	
Sex	Male	6 (66.7%)	3 (33.30%)	9 (100%)	0.12
	Female	15 (38.5%)	24 (61.50%)	39 (100%)	
Age (year)	22 – 28	11 (40.7%)	16 (59.30%)	27 (100%)	0.63
	29 – 34	10 (47.6%)	11 (52.40%)	21 (100%)	
Gingival appearance	2 – 4 mm	7 (28.0%)	18 (72.00%)	25 (100%)	0.07
	4 – 8 mm	9 (60.0%)	6 (40.00%)	15 (100%)	
	> 8 mm	5 (62.5%)	3 (37.50%)	8 (100%)	

Total	21 (43.8%)	27 (56.30%)	48 (100)

** Performed by Chi- Square test*

Table (4) illustrates the total PS based on sex, age group, and gingival appearance. The PS scores did not vary significantly by sex (P≤0.33), with 7 (77.8%) males and 35 (89.7%) females disagreeing with the impact of EGD on psychological status, whereas 2 (22.2%) males and 4 (10.3%) females agreed. No significant differences were noted across age groups either (P≤0.58), with 23 (85.2%) in the 22-28 years age group and 19 (90.5%) in the 29-34 years age group disagreeing with the impact of EGD. Conversely, 4 (14.8%) in the 22-28 years group and 2 (9.5%) in the 29-34 years group agreed. For gingival appearance, the PS scores also showed no significant differences (P≤0.49). In the 2-4 mm classification, 21 (84%) disagreed and 4 (16%) agreed with the impact of EGD on psychological status. In the 4-8 mm classification, 13 (86.7%) disagreed and 2 (13.3%) agreed. In the classification of more than 8 mm, all 8 (100%) disagreed, with none agreeing.

Table (4): Total psychological score in patients with EGD and GS

Variables		**Total score for satisfaction**			**p value***
		Disagree (Score ≤ 14) N (%)	**Agree (Score 15-21) N (%)**	**Total**	
Sex	Male	7 (77.8%)	2 (22.20%)	9 (100%)	0.33
	Female	35 (89.7%)	4 (10.30%)	39 (100%)	
Age (year)	22 – 28	23 (85.2%)	4 (14.80%)	27 (100%)	0.58
	29 – 34	19 (90.5%)	2 (9.50%)	21 (100%)	
Gingival appearance	2 – 4 mm	21 (84.0%)	4 (16.0%)	25 (100%)	0.49
	4 – 8 mm	13 (86.7%)	2 (13.30%)	15 (100%)	
	> 8 mm	8 (100%)	0 (0%)	8 (100%)	
Total		42 (43.8%)	27 (56.30%)	48 (100%)	

** Performed by Fisher- exact test*

According to the results, the overall prevalence of a GS in this study was 4.80%. The prevalence was 2.29% among males and 6.43% among females. By age group, it was 6.81% in the 18-31 years age group and 1.57% in the 32-45 years age group (Table 5).

Table (5): Gummy smile prevalence all participants in study

Variables		**Number of cases**	**Total surveyed**	**Gummy smile prevalence**
Sex	Male	9	393	2.29%
	Female	39	607	6.43%
Age	18 – 31 Years	42	617	6.81%

	32 – 45 Years	6	383	1.57%
Total		48	1000	4.80%

Discussion

According to the findings of this study, the self-perceived satisfaction scores revealed no significant differences based on sex, age groups, or gingival appearance when assessing the impact of EGD and GS on smile aesthetics and QOL. Consequently, EGD and GS did not influence the smile aesthetics or the QOL of the patients. However, lower PS in older age groups indicated a negative impact of EGD and GS on the psychological well-being of these patients, although these scores did not significantly vary by sex, age group, or gingival appearance. The prevalence of GS was higher among females and in younger age groups. The overall prevalence of GS in this study was 4.8%. Other studies have reported higher general prevalence rates of GS, ranging from 10-29% among young individuals.[1, 14] Variations in GS prevalence reported in different studies can be attributed to differences in study methodologies and target populations. For instance, Sayed et al. reported a prevalence of 52% among youth in Saudi Arabia, [15] while a study in Morocco by Bourzgui et al. found a prevalence of 35.9%.[16] Zardawi et al, and Aldelaimi et al. indicated a prevalence of over 10% in populations under 30 years of age.[6, 17] Results indicated a higher prevalence of GS among females and in younger age groups, with most patients being under 30 years old. Similar findings were reported by Tatakis et al., where GS was more prevalent among females and younger individuals.[18] The present study also noted significant differences in gingival appearance between males and females afflicted with EGD. Comparable outcomes were observed in Maleki's, and [8]Venugopal,[14] studies where most females had EGD ranging from 2-4 mm, aligning with findings from a study in Tunisia by Bouguezzi et al..[19] In contrast, most males had EGD ranging from 4-8 mm, consistent with findings from a study in Brazil by Castro et al.[20] The present study also found significant differences in PS across age groups, with older patients exhibiting lower scores, indicating the adverse effects of EGD and GS on their psychological state. An experimental study by Dawadi et al., which examined the clinical and psychological impacts of lip repositioning surgery for managing EGD, showed that EGD significantly affected patients' psychological issues and that therapeutic interventions improved these psychological conditions.[21] Zardawi et al. conducted a study on four patients who sought correction for their GS. Due to the varying reasons of their GS, several surgical methods were used to treat the condition in this series of cases. The treatments conducted included gingivectomy, osteoplasty, and modification of the lip repositioning technique. After one year of follow-up, it was seen that all of these surgical treatments successfully decreased EGD by 2 mm without any recurrence, and the patients expressed satisfaction with the aesthetic results.[6] A common concern in dentistry is the unsatisfying dental smile, primarily caused by EGD and GS. A review study by Jasser emphasized the importance of accurately diagnosing EGD for better management and treatment. If not managed properly, EGD can lead to significant psychological issues. Therefore, appropriate disease management and treatment methods are crucial to prevent psychological problems in patients.[22] While the current study found no significant differences in self-perceived satisfaction scores based on sex, age groups, or gingival appearance, other studies have observed the impact of EGD on patients' QOL. A study in Brazil by Antoniazzi et al. examined the QOL-related to oral health among EGD patients and healthy individuals, finding significant effects of EGD on functional limitations, psychological discomfort, psychological disability, and social disability.[9] In the UK, a study by Sybaite et al. investigated the impact of EGD on perceived smile aesthetics by collecting data through questionnaires and digital images from 124 participants. The study confirmed that any degree of EGD could affect smile aesthetics.[23] Furthermore, a study in Saudi Arabia assessed the prevalence of GS among young females and its correlation with OHQoL, demonstrating a direct impact of GS on smile aesthetics and QOL.[15] Similarly, a study in Croatia by Uzarevic explored the OHQoL among students, showing that while oral health did not affect QOL, it did impact physical and psychological attributes.[24] In general, various characteristics, such as age, sex, social status, and education level, are known to impact an individual's perception and knowledge of their orofacial

attractiveness. Nevertheless, Zardawi's study revealed that there were no notable variations based on age or gender in the students' perceptions of the beauty of their smiles. However, male and female students expressed distinct perspectives about face beauty and appeal.[25] More studies are needed to investigate the effect of these demographic factors.

Limitation

This study has several limitations that should be considered. First, the use of convenience sampling may limit the generalizability of the findings, as participants who voluntarily visit the dental centers may not be representative of the broader population. Second, the reliance on self-reported questionnaires may introduce bias, such as social desirability bias or inaccuracies in self-assessment. Additionally, the study's cross-sectional design prevents the establishment of causality between EGD and psychological conditions or quality of life.

Conclusions

This study highlights the higher prevalence of EGD among females and younger individuals. According to the Hills & Argyle questionnaire, PS was lower in older age groups, underscoring the negative impact of EGD and GS on patients' psychological states. Despite the lack of impact on smile aesthetics and QOL reported in this study, some patients acknowledged the influence of EGD on these aspects. Thus, timely and appropriate treatment can be beneficial in reducing problems for these patients.

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Conflict of interest

The authors declare no conflict of interest regarding the publication of this study.

REFERENCES

1. Mercado-García J, Rosso P, Gonzalvez-García M, Colina J, Fernández JM. Gummy smile: Mercado-Rosso classification system and dynamic restructuring with hyaluronic acid. Aesthetic Plast Surg. 2021 Oct;45(5):2338-2349. doi: 10.1007/s00266-021-02169-8.
2. Duruel O, Erduran NE, Tözüm TF. A modification for treatment of excessive gingival display: tooth-based lip-repositioning technique. Int J Periodontics Restorative Dent. 2020 May-Jun;40(3):457-461. doi: 10.11607/prd.4465.
3. Brizuela M, Ines D. Excessive gingival display. StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
4. Arruda CAS, Sousa FP, Alves RC. Modified lip repositioning surgery in the treatment of gummy smile. Appl Sci. 2024;14(13):5580. doi: 10.3390/app14135580.
5. Antoniazzi RP, Fischer LS, Balbinot CEA, Antoniazzi SP, Skupien JA. Impact of excessive gingival display on oral health-related quality of life in a southern Brazilian young population. J Clin Periodontol. 2017;44(10):996-1002. doi: 10.1111/jcpe.12753.
6. Zardawi FM, Gul SS, Fatih MT, Hama BJ. Surgical procedures reducing excessive gingival display in gummy smile patients with various etiologic backgrounds. Clin Adv Periodontics. 2020;10(3):130-134. doi: 10.1002/cap.10089.
7. Jasser RN. Proper diagnosis and management of dental smile esthetics from a periodontal perspective: Literature review. Saudi J Oral Dent Res. 2019;4:350-354. doi: 10.21276/sjodr.2019.4.6.8.
8. Maleki M, Huang B, Mendes VC, Caminiti MF, Finer Y. A systematic review and meta-analysis comparing surgical and nonsurgical treatments for excessive gingival display. Dent J (Basel). 2024;12(6):154. doi: 10.3390/dj12060154.
9. Antoniazzi R, Fischer L, Balbinot C, Antoniazzi S, Skupien J. Impact of excessive gingival display on oral health-related quality of life in a southern Brazilian young population. J Clin Periodontol. 2017;44(10):996-

1002. doi: 10.1111/jcpe.12753.
10. Lajnert V, Kovacevic Pavicic D, Pavlic A, Pokrajac-Bulian A, Spalj S. Smile aesthetics satisfaction scale: development and validation of a new brief five-item measure of satisfaction with smile aesthetics in adults and the elderly. Int Dent J. 2018;68(3):162-170. doi: 10.1111/idj.12362.
11. Hills P, Argyle M. The Oxford Happiness Questionnaire: a compact scale for the measurement of psychological well-being. Pers Individ Dif. 2002;33(7):1073-1082. doi: 10.1016/S0191-8869(01)00213-6.
12. Bhola M, Fairbairn PJ, Kolhatkar S, Chu SJ, Morris T, de Campos M. LipStaT: The lip stabilization technique-indications and guidelines for case selection and classification of excessive gingival display. Int J Periodontics Restorative Dent. 2015;35(4):549-559. doi: 10.11607/prd.2059.
13. Londoño Bolívar MÁ, Botero Mariaca P. The smile and its dimensions. Rev Fac Odontol Univ Antioquia. 2012;23(2):253-365.
14. Venugopal A, Manzano P, Ahmed F, Vaid NR, Bowman SJ. Gummy smiles: etiologies, diagnoses & formulating a clinically effective treatment protocol. Semin Orthod. 2024:1-21. doi: 10.1053/j.sodo.2023.11.014.
15. Al Sayed AA, Alshammari BZ, Alshammari AR, Aldajani MB, Alshammari FR. Gummy smile prevalence among Ha'il City female young adults and its impact on quality of life: a cross-sectional study. Cureus. 2023;15(12). doi: 10.7759/cureus.51302.
16. Bourzgui F, Khamlich K, Moustahfid S, Serhier Z. Gummy smile and craniofacial typologies in an adolescent population. OALib J. 2024;11:1-12. doi: 10.4236/oalib.1111137.
17. Aldelaimi T, Aldelaimi A, Enezei H, Faisal R. Gummy smile esthetic correction with 940 nm diode laser. Int Med J. 2019;26:513-515.
18. Tatakis DN, Paramitha V, Lu W-E, Guo X. Upper lip characteristics and associated excessive gingival display etiologies in adults: race and sex differences. J Periodontol. 2024;95(1):74-83. doi: 10.1002/JPER.23-0291.
19. Bouguezzi A, Boudour OH, Sioud S, Hentati H, Selmi J. Mucosal coronally positioned flap technique for management of excessive gingival display. Pan Afr Med J. 2020;36:235. doi: 10.11604/pamj.2020.36.235.22597.
20. Castro LTd, Sementille MC, Ragghianti MS, Greghi SL, Damante CA, Sant'Ana E, et al. Facial, dental, periodontal, and tomographic characteristics of the etiology of excessive gingival display: a cross-sectional clinical study. J Periodontal Implant Sci. 2024;54.
21. Dawadi A, Humagain M, Lamichhane S, Sapkota B. Clinical and psychological impact of lip repositioning surgery in the management of excessive gingival display. Saudi Dent J. 2024;36(1):84-90. doi: 10.1016/j.sdentj.2023.08.011.
22. Al-Jasser R. Proper diagnosis and management of dental smile from periodontal perspective. Saudi J Oral Dent Res. 2019;4(6):350-354. doi: 10.21276/sjodr.2019.4.6.8.
23. Sybaite J, Sharma P, Fine P, Blizard R, Leung A. The influence of varying gingival display of maxillary anterior teeth on perceptions of smile aesthetics. J Dent. 2020;103:103504. doi: 10.1016/j.jdent.2020.103504.
24. Uzarevic Z, Bulj A. Oral health-related quality of life among Croatian university students. Int J Environ Res Public Health. 2021;18(12):1-8. doi: 10.3390/ijerph18126483.
25. Zardawi F. Self-perceptions of smile and facial attractiveness among dentistry students. Clin Dermatol J. 2021;6(3):1-7. doi: 10.23880/cdoaj-16000247.