

Some factors related to gummy smile among students of Vietnam Maritime University, school year 2024 - 2025

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ABSTRACT

Gummy smile is one of the complaints of the patients, since such a situation can influence confidence and social relationships. **Objective:** This study aims to describe some related-factor to gummy smile of students at Viet Nam Maritime University and its related factors. **Methods:** A cross – sectional study was conduct on 355 students at Viet Nam Maritime University. **Results and conclusions:** Gummy smile which caused of vertical maxillary excess was most common. There is a strong positive correlation between gummy smile and incisor exposure in resting position and a weak positive correlation between gummy smile and upper lip mobility. Gummy smile has a positive correlation with bite plane angle and maxillary height angle at a moderate level; negatively correlated with facial convexity angle and Jarabak ratio at a moderate level; has a weak positive correlation with ANB angle. **Keywords:** Gummy smile, student, Viet Nam Maritime University

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INTRODUCTION

An excessive gingival display during smiling, commonly referred to as a gummy smile (GS), is characterized by more than 2–3 mm of gingival exposure and may negatively affect smile esthetics². The prevalence of gummy smile is approximately 10% in the 20–30-year-old population, with a higher incidence in females than in males³. The etiology of gummy smile is multifactorial⁴.

Gummy smile can influence self-confidence and social relationships¹. This impact is even more pronounced among dental students, who generally possess a comprehensive understanding of oral esthetics and therefore have heightened awareness of the importance of the smile⁵. In Vietnam, Võ Trung Như Ngọc and Nguyễn Việt Anh (2010) conducted a photographic study on 89 dental students aged 18–25 and reported

that 49.44% exhibited gummy smile across different smile line classifications⁶.

Most studies worldwide as well as in Vietnam have primarily focused on treatment approaches for gummy smile, while relatively few have investigated its prevalence or related factors among students. Vietnam Maritime University is a large university with a high number of students; however, no study has yet explored this issue in this population. Therefore, we conducted the study entitled: “Factors associated with gummy smile among students at Vietnam Maritime University” with the objective: To describe several factors related to gummy smile among students of Vietnam Maritime University in the academic year 2024–2025.

MATERIALS AND METHODS

Study population

Participants: Students of Vietnam Maritime University

Inclusion criteria

- Age: 18–25 years
- Willingness to participate in the study
- Presence of a full set of anterior teeth in both arches
- No periodontal or gingival diseases
- No history of surgical treatment for gummy smile

Exclusion criteria

- Presence of prosthetic restorations in the anterior region of either arch
- Current or previous orthodontic treatment
- History of maxillofacial cosmetic surgery
- Inability to capture smile photographs
- Congenital craniofacial anomalies

Study duration and location

Duration: March 2024 – May 2025

Location: Vietnam Maritime University

Study design: Cross-sectional descriptive study

Sample size calculation:

Sample size was determined using the formula:

$$n = Z_{1-\alpha/2}^2 \frac{p(1-p)}{d^2}$$

Where:

- n: required sample size
- $Z_{1-\alpha/2}$: standard normal variate at 95% confidence level ($Z = 1.96$)
- $p = 0.36$ (prevalence of gummy smile according to Lê Quang Linh and Nguyễn Mạnh Phú⁷)
- $d = 0.05$ (desired precision)

The required sample size was calculated as $n = 355$.

Sampling method: Convenience sampling

Study variables: Gender, amount of gingival display during maximum smile, upper lip length, smile line classification.

Data processing and analysis: Data were entered using Microsoft Excel and analyzed with SPSS 22.0. Chi-square test was applied to compare proportions, and Student’s t-test was used to compare means.

Ethical considerations: All participants were fully informed about the study objectives. Participation was entirely voluntary. The study did not pose any risk to participants’ health. All collected data were kept confidential and used solely for research purposes.

RESULTS

Table 3.1. Correlation between gummy smile and the width/height ratio of the maxillary central incisors

Smile	Presence of gummy smile		Absence of gummy smile		p (*)	Correlation coefficient (r)
	\bar{X}	± SD	\bar{X}	± SD		
Width/Height ratio (%)						
Tooth number 11	85,78	1,98	86,16	1,65	0,130	-0,119
Tooth number 21	85,85	1,27	86,02	1,12	0,300	-0,169

The findings indicate that the presence of a gummy smile is not significantly associated with the width/height ratio of the maxillary central incisors (R11, R21). The lack of statistical significance ($p > 0.05$) suggests that variations in tooth proportion do not appear to contribute to the occurrence of a gummy smile.

Table 3.2. Correlation between gummy smile and philtrum height, upper lip height, maxillary incisor display at rest, and upper lip mobility during maximum smile (n = 355)

Characteristics	Smile	Presence of gummy smile (n=73)		Absence of gummy smile (n=279)		p(*)	Correlation coefficient (r)
		\bar{X}	± SD	\bar{X}	± SD		
		Upper lip height (mm)	22,01	0,66	22,12		
At rest position	Philtrum height (mm)	12,89	0,78	12,96	0,62	0,479	-0,023
	Maxillary incisor display (mm)	5,54	0,63	1,21	0,32	<0.001	0,502
At maximum smile position	Upper lip mobility (mm)	7,74	0,51	6,21	0,18	<0.001	0,223

Gummy smile demonstrated a strong positive correlation with maxillary incisor display at rest ($|r| > 0.5$, $p < 0.05$). In addition, gummy smile showed a weak positive correlation with upper lip mobility during maximum smile ($|r| < 0.3$, $p < 0.05$).

Table 3.3. Correlation between gummy smile and occlusal plane angle, nasolabial angle, facial convexity angle, ANB angle, and Jarabak ratio (n = 355)

Cephalometric variables	Smile	Presence of gummy smile (n=19)		Absence of gummy smile (n=70)		p	Correlation coefficient (r)
		\bar{X}	± SD	\bar{X}	± SD		
		Angular measurements (degree)					
Occ/SN	20,52	0,87	15,12	0,47	<0,001	0,436	
Cm-Sn-Ls	91,92	1,48	92,12	1,32	0,598	-0,063	
Gl'-Sn-Pog'	161,78	0,78	169,78	0,58	<0,001	-0,401	
ANB	4,22	0,56	3,89	0,41	0,024	0,289	
U1/NA	25,16	1,61	24,48	1,21	0,100		
N-CF-A	64,05	1,01	58,96	1,12	<0,001	0,502	
Linear measurements (mm)							
I-NA	6,12	0,42	5,97	0,48	0,190		

Proportional measurements						
Tỷ lệ Jarabak	64,12	1,02	69,82	0,89	<0,001	-0,402

Gummy smile demonstrated a moderate positive correlation with occlusal plane angle (Occ/SN) and maxillary height angle (N-CF-A). Conversely, it showed a moderate negative correlation with facial convexity angle (Gl'-Sn-Pog') and Jarabak ratio. In addition, a weak positive correlation was found with ANB angle.

Table 3.4. Contributing factors in the gummy smile group

Contributing factor	Frequency (n)	Percentage (%)
Hyperactive upper lip muscle	11	15,06
Delayed passive eruption	8	10,95
Vertical maxillary excess	27	36,98
Delayed passive eruption + Vertical maxillary excess	4	5,48
Delayed passive eruption + Hyperactive upper lip muscle	4	5,48
Hyperactive upper lip muscle + Vertical maxillary excess	8	10,96
Short upper lip + Delayed passive eruption + Vertical maxillary excess	11	15,09
Total	73	100

Vertical maxillary excess accounted for the highest proportion among the etiological factors of gummy smile (68.51%).

DISCUSSION

Dental factors

In our study, 36.98% of patients with gummy smile presented with vertical maxillary excess, while 37.0% exhibited delayed passive eruption. Moreover, the discrepancy in the width/height ratio between the maxillary central incisors R11 and R21 indicates that delayed passive eruption may occur unevenly among teeth within the same arch of a patient. Correlation analysis demonstrated no significant relationship between gummy smile and the width/height ratio of the maxillary central incisors R11 and R21 ($p > 0.05$).

Soft tissue factors

Our results showed no significant difference in philtrum height between the gummy smile and non-gummy smile groups ($p > 0.05$). The absence of correlation suggests that philtrum

height alone is not a determining factor, since gummy smile is typically multifactorial.

Patients with shorter upper lips demonstrated greater exposure of the maxillary central incisors compared with those with longer upper lips. A strong positive correlation was observed between gummy smile and incisor display at rest ($|r| > 0.5$, $p < 0.05$).

Upper lip mobility exceeding 9 mm is commonly diagnosed as hyperactive upper lip muscle. In this study, the mean upper lip mobility of the gummy smile group was 7.74 mm, significantly higher than that of the non-gummy smile group (6.21 mm) ($p < 0.05$). Correlation analysis revealed a weak positive association between gummy smile and upper lip mobility ($|r| < 0.3$, $p < 0.05$).

Skeletal factors

Patients with vertical maxillary excess often present with increased facial convexity angle. However, if both jaws are protrusive, the

convexity angle decreases. Our findings showed a significant difference in facial convexity angle (G1'-Sn-Pog') between the gummy smile and non-gummy smile groups ($p < 0.05$). Gummy smile exhibited a moderate negative correlation with the convexity angle ($|r| = 0.3-0.5$, $p < 0.05$).

The occlusal plane angle is usually greater in skeletal Class II patients, in whom gummy smile is frequently observed. In this study, the gummy smile group had a significantly larger occlusal plane angle (Occ/SN) than the non-gummy smile group ($p < 0.001$). A moderate positive correlation was observed between gummy smile and occlusal plane angle ($r > 0$, $|r| = 0.3-0.5$, $p < 0.05$), suggesting that a steeper occlusal plane increases the severity of gummy smile.

Skeletal Class II not only increases gingival display but also contributes to a higher frequency of gummy smile. In our analysis, the mean ANB angle of the gummy smile group was $4.72^\circ \pm 0.56^\circ$, significantly greater than that of the non-gummy smile group ($3.51^\circ \pm 0.41^\circ$) ($p < 0.05$). According to Steiner's analysis, $ANB > 4^\circ$ indicates Class II skeletal relationship, supporting the finding that Class II skeletal pattern is more strongly associated with gummy smile compared with Class I or Class III, and may be considered a "characteristic facial type" of gummy smile.

In addition, the mean Jarabak ratio in the gummy smile group was 64.12 ± 1.02 , which was significantly reduced, reflecting a vertical growth tendency and long-face pattern. This is consistent with findings from Hao Wu, Ma Haini, Impellizzeri, and Hayani⁸, who reported similar associations between long-face morphology and gummy smile. Correlation analysis showed a moderate negative relationship between

gummy smile and Jarabak ratio ($|r| = 0.3-0.5$, $p < 0.05$).

The maxillary height angle was also significantly higher in the gummy smile group ($64.05^\circ \pm 1.01^\circ$) compared with the non-gummy smile group ($58.96^\circ \pm 1.12^\circ$) ($p < 0.05$). This result aligns with the study of Jaime Fabián Gutiérrez Rojo, who reported that Class II skeletal pattern is associated with a larger maxillary height angle compared with Class I and Class III. Correlation analysis in our study demonstrated a moderate positive association between gummy smile and maxillary height angle ($|r| = 0.3-0.5$, $p < 0.05$).

From Table 3.4, vertical maxillary excess was identified as the most prevalent etiological factor, accounting for 68.51% of cases, of which 36.98% were associated with a single factor. This finding suggests that a considerable proportion of patients with gummy smile may require combined surgical or adjunctive interventions for effective management.

CONCLUSION

Gummy smile is most commonly associated with vertical maxillary excess.

It demonstrates a strong positive correlation with incisor display at rest, and a weak positive correlation with upper lip mobility.

Moderate positive correlations were found with occlusal plane angle and maxillary height angle, while moderate negative correlations were observed with facial convexity angle and Jarabak ratio. A weak positive correlation was noted with ANB angle.

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