

EVALUATION OF OCCLUSAL FEATURE AND ORTHODONTIC TREATMENT NEEDS IN STUDENTS AT TRA VINH UNIVERSITY

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ABSTRACT

Objective: This study aimed to assess the occlusion characteristics and orthodontic treatment needs according to Index of Orthodontic Treatment Need Tra Vinh University student aged 18-19.

Materials and methods: A total of 250 students (males and 144 females) were selected using a systematic random sampling method from June 2024 to June 2025. A cross-sectional study was conducted to evaluate occlusal characteristics through clinical examination, extraoral and intraoral photographs, and dental cast analysis. Orthodontic treatment needs were assessed using the Index of Orthodontic Treatment Need (IOTN). **Results:** Facial symmetry was observed in 83.6% of students, and a convex facial profile was the most prevalent (53.2%). Malocclusion was identified in 89.2% of participants, Normal overjet and overbite were observed in 66.0% and 75.6% of students, respectively. According to the IOTN, 31.6% of students required orthodontic treatment based on the Dental Health Component (DHC), while 10.4% demonstrated treatment needs according to the Aesthetic Component (AC).

Conclusion: Malocclusion and orthodontic treatment needs were highly prevalent among the study population. Early assessment is recommended to facilitate appropriate management strategies.

Keywords: Malocclusion, orthodontic treatment need, IOTN

I. INTRODUCTION

Malocclusion is one of the most common oral health problems, affecting mastication, speech, facial aesthetics, and psychosocial well-being. According to the World Health Organization, malocclusion was ranked as the third most prevalent oral health condition, after dental caries and periodontal disease. The malocclusion prevalence varies across countries, regions, and age groups due to differences in genetic, environmental, functional, and oral hygiene factors. In Vietnam, the prevalence of malocclusion is high across all age groups. Tham DK (2000) reported that 83.2% of the Vietnamese population exhibited malocclusion

[3]. Similarly, Bayarsaikhan O (2024) found a malocclusion prevalence of 84.5% students in Mongolia, with 8.1% requiring treatment according to the DHC and 6.9% according to the AC [5].

In recent years, as concerns about aesthetics and social interaction have increased, the need for orthodontic treatment among adolescents and young adults has grown significantly. Accurate assessment of malocclusion and orthodontic treatment needs is essential for formulating appropriate treatment plans and promoting oral health awareness.

Angle classification remains the most widely used method, which is used for categorizing malocclusion based on the relationship between the maxillary and mandibular first molars. Meanwhile, the IOTN provides an objective measure of treatment necessity from both clinical (DHC index) and aesthetic (AC index) perspectives.

University students constitute a young population that is increasingly aware of oral health and aesthetics. However, research comprehensively evaluating their occlusal conditions remains limited. In Vietnam, data regarding the prevalence of malocclusion and the need for orthodontic treatment among young students are limited. Therefore, this study aimed to assess the prevalence of malocclusion and determine the orthodontic treatment needs of students at Tra Vinh University.

II. MATERIALS AND METHODS

2.1. Study population: The study included first-year students at Tra Vinh University, aged 18-19 years.

2.2. Inclusion criteria: Participants had no congenital craniofacial deformities, no previous orthodontic or prosthetic treatment, and fully erupted permanent first molars and canines.

2.3. Study Design: This research employed a descriptive cross-sectional design. A total of 250 first-year students from Tra Vinh University were selected using a systematic random

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Date of receipt: 14.1.2026

Date of scientific judgment: 4.3.2026

Reviewed date: 15.4.2026

sampling technique. Study was conducted from June 2024 to June 2025.

2.4. Data Collection: Data were collected through the following five steps: (1) General information and clinical examination: Basic demographic data were recorded, and extraoral and intraoral examinations were performed using a standardized data collection form. (2) Photographic documentation: Standardized extraoral and intraoral photographs were taken for each participant. (3) Model fabrication: Alginate impressions of both arches and interocclusal wax records in maximum intercuspation were obtained. Impressions were poured in dental stone, and the casts were mounted on an articulator. (4) Model analysis: Measurements and assessments were performed on the dental casts. The identified variables include: occlusal relationship according to Angle's classification, overjet, overbite, and changes in tooth position. (5) Assessment of treatment needs: Orthodontic treatment needs were evaluated using the Index of Orthodontic Treatment Need (IOTN).

2.5. Ethical Approval: This study was approved by the Ethics Council of Tra Vinh University. All participants provided written informed consent after receiving a full explanation of the study objectives and procedures.

2.6. Statistical analysis: The data were analyzed using Statistical Package for the Social Sciences (SPSS) software (version 25.0), and the significance level was set at $p < 0.05$ for all analyses. As the data was normally distributed according to the Shapiro- Wilk test, descriptive statistics (mean, frequencies, and percentages) were used to summarize demographic characteristic of gender, as well as the

orthodontic parameters (overjet, reverse overjet, overbite, anterior open bite, and buccal crossbite). Also, to examine associations between gender and the severity of malocclusion (IOTN-DHC grades), Chi-square tests were employed. Furthermore, sensitivity analyses were conducted to check the robustness of the findings by running the analysis with and without imputed data to evaluate the impact of missing data on the results. Interaction analyses were performed using a logistic regression model to assess the effect of gender and its interaction with different malocclusion types on the need for orthodontic treatment.

III. RESULTS

3.1. Extra and intra - oral features

Table 1. Extraoral Clinical Features of the Study Participants

Extra-oral features		n	%
Facial symmetry	Symmetrical	209	83.6
	Deviation to the left	17	6.8
	Deviation to the right	24	9.6
Facial profile	Straight	99	39.6
	Convex	133	53.2
	Concave	18	7.2

This study was conducted on 250 students (106 males and 144 females). Among the students, 83.6% exhibited facial symmetry, whereas 16.4% showed asymmetry, including right-sided (9.6%) and left-sided (6.8%) deviations. Regarding facial profile, the convex type predominated (53.2%), followed by the straight profile (39.6%) and the concave profile (7.2%).

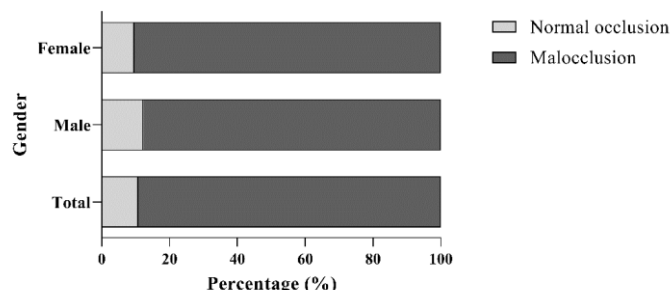


Figure 1. Prevalence of malocclusion among the study population

The overall prevalence of malocclusion was 89.2%, including 87.7% in males and 90.3% in females.

3.2. Assessment of occlusal characteristics among Tra Vinh University students

Table 2. Occlusal features of Tra Vinh University students

Parameters		Gender n (%)		χ^2 (p-value)	Total n (%)
		Male (n=106)	Female (n=144)		
Overjet	≤ 0 mm	19 (17.9)	18 (12.5)	$\chi^2 = 1.247$ (p = 0.536)	37 (14.8)
	0–4 mm	66 (62.3)	99 (68.8)		165 (66.0)
	≥ 4 mm	21 (19.8)	27 (18.8)		48 (19.2)
Overbite	≤ 0 mm	14 (13.2)	11 (7.6)	$\chi^2 = 7.444$ (p = 0.024)	25 (10.0)
	0–4 mm	71 (67.0)	118 (81.9)		189 (75.6)
	≥ 4 mm	21 (19.8)	15 (10.4)		36 (14.4)
Tooth displacement	≤ 4mm	87 (82.1)	131 (91.0)	$\chi^2 = 5.485$ (p = 0.019)	218 (87.2)
	> 4mm	19 (17.9)	13 (9.0)		32 (12.8)

The analysis showed that 66.0% of participants had a normal overjet, while 19.2% exhibited increased overjet. A normal overbite was observed in 75.6%, and 14.4% presented with deep bite. The majority (87.2%) had tooth displacement ≤ 4 mm.

Table 3. The dental health issues according to IOTN

Parameter	n	%
Tooth displacement > 1 mm	181	41.1
Crossbite	67	15.3
DHC grade 1	52	11.8
Excess overjet (overjet > 3.5 mm)	51	11.6
Excess overbite (overbite > 3.5 mm)	41	9.4
Anterior crossbite	35	7.9
Open bite	13	2.9

Among 250 participants, the most frequent dental health issue according to the IOTN classification was tooth displacement > 1 mm (41.1%), followed by crossbite (15.3%), DHC grade 1 (11.8%), excess overjet (11.6%), and excess overbite (9.4%).

3.3. The orthodontic treatment needs in population according to IOTN

Table 4. The correlation between DHC and Aesthetic (AC)

AC n (%)	DHC n (%)					Total N (%)	P-value
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5		
Level 1-2	35 (14.0)	15 (6.0)	11 (4.4)	2 (0.8)	1 (0.4)	64 (25.6)	0.001
Level 3-4	1 (0.4)	39 (15.6)	35 (14.0)	19 (7.6)	2 (0.8)	96 (38.4)	
Level 5-7	0 (0.0)	0 (0.0)	31 (12.4)	26 (10.4)	7 (2.8)	64 (25.6)	
Level 8-10	0 (0.0)	1 (0.4)	3 (1.2)	11 (4.4)	11 (4.4)	26 (10.4)	
Total n (%)	36 (14.4)	55 (22.0)	80 (32.0)	58 (23.2)	21 (8.4)	250 (100.0)	

The Chi-square test revealed that there was a statistically significant relationship between the DHC and AC components (p=0.001).

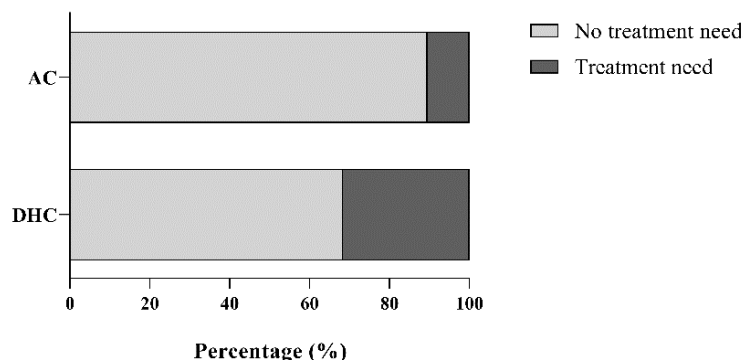


Figure 2. Degree of Consensus on Orthodontic Treatment Need Based on IOTN DHC and AC

Overall, 31.6% of students required orthodontic treatment based on the DHC, whereas 10.4% demonstrated treatment needs based on the AC of the IOTN. Agreement between the two components was moderate (Kappa = 0.311).

IV. DISCUSSION

4.1. Extra-oral feature in the study population

In the frontal facial examination, 83.6% of the students had symmetrical faces, while 16.4% showed facial asymmetry, including right deviation (9.6%) and left deviation (6.8%). These results differ from those of Talisman R et al. (2022) [10], who reported that distances from the facial midline to anatomical landmarks, such as the zygomatic arch and mandibular angle, were greater on the right side, indicating a predominance of right-sided facial development. However, the right landmarks were located farther from the midline, suggesting a slight leftward inclination of the face [8]. This discrepancy may reflect differences between quantitative measurement methods and visual assessment approaches.

In the profile view, the convex facial type was predominant, accounting for 53.2%, followed by the straight (39.6%) and concave (7.2%) types, as the population is Asian, where the convex profile is the most common. These findings are consistent with several studies; for instance, Brahmenta and Arya (2024) reported that the convex profile had the highest prevalence (89.2%) in Indonesia [6]. Minor variations between studies may reflect anthropological diversity among populations as well as the influence of environmental, nutritional, and functional habit factors.

4.2. Malocclusion feature in the study population

The prevalence of malocclusion was 89.2%, with 87.7% in males and 90.3% in females, indicating its widespread occurrence in the community. A statistically significant difference was not found between the two genders ($p = 0.52$), suggesting that gender does not influence the prevalence of malocclusion. These findings are consistent with previous studies that have identified genetic factors, deleterious oral habits

during growth, and premature loss of deciduous teeth as more significant contributors.

A high prevalence of malocclusion has also been reported in several investigations. Le Linh Chi (2023) found that 91.8% of the population in Vietnam presented with malocclusion [1]. Moreover, Lecturer (2020) reported a rate of 87.4% in Malaysia [8], while Bayarsaikhan O (2024) found a rate of 84.5% in Mongolia [5]. These findings collectively highlight a typical pattern among developing nations, where preventive dental care systems remain limited, awareness of oral health is insufficient, and early orthodontic intervention receives insufficient attention.

4.3. Occlusal characteristics of the study population

The present study found that most students exhibited normal overjet, accounting for females (68.8%) and males (62.3%). Excess overjet was found in 19.2% of participants. These findings suggest that most participants in this study presented a balanced occlusal development. This result was comparable to that of Gudipaneni RK (2018), who reported that 66.4% of individuals presented with a normal overjet in Saudi Arabia [7]. However, this study finding was slightly lower than that of Cao Minh Nha Uyen (2020), who reported normal overjet rates of 72.9% [4].

Overbite is a key indicator in evaluating the vertical dimension of occlusion, as overbite deviations can compromise masticatory function, esthetics, and overall oral health-related quality of life. In this study, 75.6% of students exhibited normal overbite, followed by excess overbite (14.4% demonstrated), and open bite or edge-to-edge relationships (10%). These results were consistent with those of Cao Minh Nha Uyen (2020) and Le Linh Chi (2024), who reported normal overbite rates of 74.7% [4] and 70.4% [1], respectively. The open-bite or edge-to-edge bite percentages in the current study were similar to those reported by Gudipaneni RK (2018), who reported a rate of 11.2% in Saudi adolescents [7]. Conversely, the prevalence of excess overbite in this study was lower than that reported by Cao Minh Nha Uyen (2020) (21.5%) [4] and Gudipaneni RK (2018) (23.4%) [7].

Tooth displacement is defined as the misalignment of teeth within the dental arch,

including crowding or spacing. Mild displacement (≤ 4 mm) was observed in 87.2% of students, with a higher rate in females (90.97%) than in males (82.08%). In contrast, moderate displacement (>4 mm), considered clinically significant, was observed in 12.8% of the total sample, with a notably higher rate in males (17.92%) than in females (9.03%). This suggests that male students are more prone to severe tooth displacement, possibly due to differences in craniofacial growth patterns, genetic predisposition, deleterious oral habits during childhood, or less consistent attention to oral hygiene compared with females. The prevalence of moderate displacement in the present study was lower than that reported by Cao Minh Nha Uyen (2020), who found rates of 20.5% in the maxilla and 23.8% in the mandible [4]. In addition, Gudipaneni RK (2018) [7] reported a high rate of tooth displacement. Variation results can be attributed to differences in population age, which affect the stages of dental and skeletal development. Tooth displacement is among the most common conditions requiring orthodontic intervention, primarily resulting from crowding. Crowding often arises when the mesiodistal dimensions of permanent teeth exceed the available arch length, resulting in interproximal caries in primary teeth or space loss due to early extraction of primary molars. Severe crowding can predispose individuals to various oral health problems, including dental caries, periodontal disease, and impaired masticatory function.

4.4. Orthodontic treatment needs among students of Tra Vinh University

Clinical examination revealed that tooth displacement was the most prevalent dental health concern (41.1%), followed by crossbite (15.3%), Grade 1 dental health (11.8%), excess overjet (11.6%), and excess overbite (9.4%). These results are consistent with Dang Thi Thu Huong's (2020) observations, which reported that tooth position changes occurred in 59.7% of cases [2]. Collectively, these findings suggest that tooth malposition and displacement represent predominant features of malocclusion within the community.

In this study, the requirement for orthodontic treatment based on DHC was higher

than that reported by Le Linh Chi (2023) (23.4%) [1], but lower than that observed by Cao Minh Nha Uyen (2020), where 44.4% of individuals required treatment [4]. The proportion requiring treatment (Grades 4 and 5) in the present study was higher than in Negri P (2021) (27,55%) [9], and Bayarsaikhan O (2024) (8,1%) [5]. Conversely, studies from Southeast Asia, such as Utari TR (2025) and Zreaqat M (2013), revealed substantially higher treatment needs, ranging from 30% to over 60% [11],[12]. These variations may be attributed to differences in age distribution, population features, location, and accessibility of dental care services. The absence of a significant difference in treatment needs between male and female students in this study supports previous evidence indicating that gender is not a decisive factor in orthodontic treatment needs according to the IOTN.

In terms of aesthetic treatment needs, the findings of this study were lower than those reported by Le Linh Chi (2023) [1], who found that 13.2% of participants exhibited an aesthetic treatment need, yet higher than the 6.9% reported by Bayarsaikhan O (2024) [5]. Furthermore, a substantial proportion of participants were in the low aesthetic treatment need group (grades 1-4), particularly among male students, suggesting gender-related differences in aesthetic self-perception. Female students tended to self-evaluate their dental irregularities as more severe, as reflected in their higher proportion within the moderate treatment need category (grades 5 to 7). This trend indicates that gender may influence perceptions of facial appearance and dental aesthetics.

A marked discrepancy was identified between treatment needs assessed by DHC and those determined by AC. Specifically, 31.6% of participants required treatment according to the IOTN-DHC, substantially exceeding the 10.4% identified through the IOTN-AC. This difference can be attributed to the DHC's objective, clinically oriented indications, which evaluate parameters such as overjet, overbite, crowding, open bite, crossbite, supernumerary teeth, and impaction. These features have a direct influence on mastication, speech, and oral hygiene, making them readily detectable and more likely to be categorized as requiring treatment.

Therefore, the proportion of treatment needs determined by DHC is typically higher and more reflective of functional impairment.

In contrast, the AC relies primarily on subjective visual assessment, which may overlook cases of significant functional malocclusion without apparent aesthetic impact. The IOTN, incorporating both DHC and AC, thus offers a comprehensive evaluation, DHC providing an objective measure of occlusal and functional health, while AC emphasizes aesthetic considerations that often motivate individuals to seek orthodontic care. Together, these components deliver a balanced understanding of orthodontic treatment needs, integrating both functional and psychosocial dimensions of oral health.

V. CONCLUSIONS

The prevalence of malocclusion was high (89.2%). Most students had a moderate need for orthodontic treatment, with no significant differences between males and females according to the IOTN index.

REFERENCES

1. **Lê Linh Chi** (2024), "Thực trạng lệch lạc khớp cắn và nhu cầu điều trị chỉnh nha của học sinh 14 tuổi tại Trường Trung học cơ sở Hoàng Long, Hà Nội năm 2023", *Tạp chí y học Việt Nam*, tr. 250 - 257.
2. **Đặng Thị Thu Hương** (2020), "Nhu cầu điều trị nắn chỉnh răng và một số yếu tố liên quan của học sinh trong độ tuổi 12 – 15 tại thành phố Hà Nội", Luận văn Thạc sĩ Y học, Trường Đại học Y Hà Nội
3. **Đồng Khắc Thắm, Hoàng Tử Hùng** (2000), "Khảo sát tình trạng khớp cắn người Việt trong độ tuổi 17-27", Luận văn thạc sĩ y khoa, Đại học Y dược Tp Hồ Chí Minh.
4. **Cao Minh Nhã Uyên** (2020), "Tình trạng sai khớp cắn và nhu cầu điều trị chỉnh hình răng mặt của học sinh 12 tuổi và 15 tuổi tại thành phố Hồ Chí Minh năm 2019", Luận văn thạc sĩ Răng Hàm Mặt, Trường Đại học Y Dược Thành phố Hồ Chí Minh.
5. **Bayarsaikhan O**, Munkh-Erdene O, Boldbaatar T, Gantulga O, Tanaka E, (2024). "Prevalence of Malocclusion and Orthodontic Treatment Need in 9- to 12-Year-Old Schoolchildren in Ulaanbaatar, Mongolia." *Cureus*, 16(7), pp. 65495.
6. **Brahmanta, Arya, Syahdinda, Meralda Rossey, Kurniawan, Hansen, Marya, Anand, Chandrasekharan, Deepak** (2024). "Facial profile determination using a novel face analyzer orthodontic mobile application." *Journal of Orthodontic Science*, 13(1):52.
7. **Gudipani RK, Aldahmeshi RF, Patil SR, Alam MK** (2018). "The prevalence of malocclusion and the need for orthodontic treatment among adolescents in the northern border region of Saudi Arabia: an epidemiological study." *BMC Oral Health*, 18(1), pp. 16–20.
8. **Lecturer, et al.** (2020). "Prevalence of malocclusion and occlusal traits of Malay adults (18–23 years) in Shah Alam, Malaysia." *Int J Dent Res*, 5(2), pp. 81–85.
9. **Negri P, et al.** (2021). "Index of Orthodontic Treatment Need (IOTN) and distribution of malocclusion traits in a population of growing patients attending a public orthodontic service in Perugia (Italy)." *Eur J Paediatr Dent*, 22(4), pp. 303–308.
10. **Talisman R, Arnon O**, (2022). "Weinberger A. Facial asymmetry, the right-side dominance: A retrospective analysis of 315 consecutive series of patients." *JPRAS Open*, 11(35), pp. 18–23.
11. **Utari TR, Farani W, Nissa TA** (2025). "Tingkat Keparahan Maloklusi Dan Kebutuhan Perawatan Ortodonti Pada Remaja Menggunakan Index of Orthodontic Treatment Need (IOTN)." *Stomatognathic Jurnal Kedokteran Gigi*, 22(1).
12. **Zreaqat M, Hassan R, Ismail AR, Ismail NM, Aziz FA** (2013). "Orthodontic treatment need and demand among 12- and 16-year-old school children in Malaysia." *Oral Health Dent Manag*, 12(4), pp. 217–221.