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Original article

PREVALENCE OF ORTHODONTIC TREATMENT NEED AMONG YOUNG ADULTS AGED 18 TO 25 YEARS – A PILOT STUDY

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Abstract

Introduction: Malocclusion is the most common oral condition among adolescents and young adults, significantly impacting functional, aesthetic, and psychosocial health. The Index of Orthodontic Treatment Need – Dental Health Component (IOTN-DHC) is a validated and widely used instrument for the objective clinical assessment of malocclusion severity and for identifying individuals who would benefit most from orthodontic treatment.

Objective: The aim of this study was to assess the prevalence and severity of the need for orthodontic treatment among young adults aged 18 to 25 years, using the IOTN-DHC.

Materials and methods: This was a cross-sectional study. The sample consisted of patients aged 18 to 25 years with diagnosed malocclusion. The severity of malocclusion was assessed using the study models of each subject, and the severity was classified according to the five grades of the IOTN-DHC.

Results: The study included 38 participants (28 women, 10 men; ratio 2.6:1), with a mean age of 19.89±2.36 years, with no significant difference between the sexes (p=0.3119). The most frequently represented IOTN-DHC category was IOTN 4(36.84%), followed by IOTN 3(26.32%), IOTN 2(23.68%), and IOTN 5(13.16%). Sex showed no significant association with IOTN category (p=0.7235), while age differed significantly between categories (p=0.0301).

Conclusion: The findings indicate a high prevalence of moderate to severe malocclusion, as well as a significant association between age and the severity of malocclusion, unlike sex, which warrants further research.

Keywords: malocclusion, young adults, orthodontic treatment need

Introduction

World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity, influenced by various factors, such as genetics, lifestyle, environment, and socio-economic status. Oral health is an important component of health and affects general health, social well-being, development, and education[1,2].

Awareness represents a cognitive state, that is, the individual's ability to perceive, understand, and recognize a particular condition or need. In the context of orthodontic practice, there is a need for the systematic determination of awareness levels among adolescent patients regarding the need for orthodontic treatment, given that this age group constitutes the majority

of orthodontic patients. Previous studies have assessed awareness of oral health and the need for orthodontic treatment among preadolescents and adolescents[3,4].

Malocclusions are among the most prevalent oral health conditions and require comprehensive diagnostic assessment and an appropriate therapeutic approach. Besides causing functional disturbances, they frequently give rise to aesthetic impairments that affect quality of life. They can also have significant psychosocial implications, particularly in children and adolescents, in whom aesthetic perception and social interaction are especially important for psychological development[5,6].

Therefore, when assessing the impact of malocclusion, it is important to consider the various aspects that may be affected, as well as their relationship to the severity of the condition. Certain individuals with pronounced malocclusion are satisfied with the appearance of their teeth or indifferent to it, whereas others experience considerable concern even with minimal deviations[7].

The Index of Orthodontic Treatment Need (IOTN), developed by Brook and Shaw in 1989, is a system for assessing and quantifying the need for orthodontic treatment. Owing to its simplicity, reliability and objectivity, it quickly became an internationally recognized tool[3]. The Dental Health Component (DHC) addresses the functional and biological aspects of malocclusion and classifies patients into five categories according to its severity[8].

IOTN is an internationally validated instrument that is widely applied in epidemiological research within the field of orthodontics. Its application is not limited solely to assessing treatment need, but also enables the determination of priorities for the implementation of therapeutic interventions, which represents a particularly significant aspect in the context of healthcare systems operating with limited resources.

Determining the prevalence of pronounced need for orthodontic treatment is a key step in clinical and epidemiological assessment, as it enables timely identification of affected individuals and their appropriate counselling and referral for orthodontic intervention[9]. Data on treatment need among young adults are also relevant for assessing satisfaction with dentofacial appearance, in both treated and untreated individuals, and allow evaluation of treatment outcomes[10,11]. Although studies in young populations report a clearly pronounced need for orthodontic treatment in up to 50% of participants, malocclusion is undisputedly a significant public health problem in every country[9,12,13].

The aim of the study was to determine the prevalence and severity of malocclusion among participants aged 18 to 25 years using the IOTN-DHC index.

Materials and methods

The study was designed as an analytical cross-sectional study, conducted at the Faculty of Dentistry at Ss. Cyril and Methodius University (UKIM) in Skopje, in collaboration with one private orthodontic practice in the city of Skopje, during the period from April to June 2026.

The study included 38 participants with clinically diagnosed malocclusion. Participant selection was carried out according to the simple random sampling method. The inclusion criteria were: a diagnosis of malocclusion justifying orthodontic intervention; age 18-25 years; and complete permanent dentition (with the exception of third molars). The exclusion criteria were: craniofacial syndromes or severe systemic diseases; presence of active periodontal disease or untreated caries; and previous orthognathic surgery.

The IOTN-DHC assessment was performed on plaster study models of each participant's dentition, prepared according to a standardized procedure of alginate impression-taking and their subsequent casting in plaster. Through detailed visual inspection and measurement of the study models, the presence and degree of severity of the relevant occlusal features (such as open bite, rotations, transpositions, as well as space deficiency or excess, etc.)

were determined. Each case was classified into the corresponding IOTN-DHC grade: IOTN 1 (no treatment need), IOTN 2 (mild anomaly, no treatment need), IOTN 3 (borderline case, treatment may or may not be necessary), IOTN 4 (treatment needed), and IOTN 5 (urgent need for treatment).

After the study objectives had been explained to each participant, oral informed consent was obtained. The survey was approved by the Ethics Committee of the Faculty of Medicine, Ss. Cyril and Methodius University in Skopje, under approval number 02-3780/13.

Statistical analysis

The data were analyzed using the SPSS software package, version 26.0 for Windows. Qualitative variables were presented as absolute and relative frequencies. Numerical variables were analyzed using measures of central tendency and measures of dispersion, including standard deviation. The Difference test was used to compare proportions. Fisher Freeman - Halton Exact test was used to determine if there was a significant association between two categorical, binary variables. The Shapiro-Wilk W test was used to assess the normality of the distribution of the variables under study. The Kruskal-Wallis H test was used to assess the statistical significance of differences among multiple numerical variables with non-normal distributions. Statistical significance was assessed using a two-tailed test, with a significance level of $p<0.05$.

Results

The study included 38 (100%) participants, of whom 28 (73.68%) were female and 10 (26.31%) were male, with a female: male ratio of 2.6 : 1. The percentage difference between the two sexes in the overall sample was statistically significant using the Difference test: Difference 47.37% [(25.18–63.41) CI 95%; p=0.0001], in favor of a significantly higher percentage of female participants (Table 1 and Figure 1).

The mean participants' age in the overall sample was 19.79±2.42 years, with a min/max age of 18/25 years. The analysis indicated that 50% of patients in the overall sample were aged ≥19 years, while 25% of them were aged 18 years [median (IQR)=19 (18-21)] (Table 1 and Figure 1).

Table 1. Distribution of participants according to sex and age (years)

Age		Statistics	Std. Error	95% Confidence Interval for Mean	
				Lower	Upper
Participants	*Women*				
	Number (N)	28	0.45	18.98	20.81
	Mean ±SD	19.89±2.36			
	Min/ Max	18/25			
	Median – IQR range	19(18-21)			
	Men				
	Number (N)	10	0.85	17.58	21.41
	Mean ±SD	19.50±2.68			
	Min/ Max	18/25			
	Median – IQR range	18(18-19)			
	Total				
	Number (N)	38	0.39	18.99	20.58
	Mean ±SD	19.79±2.42			
	Min/ Max	18/25			
	Median – IQR range	19(18-21)			

Women/ Men - Mann Whitney U test: Z=1.011; p=0.3119, *significant at p<0.05

The mean participants' age in the female and male groups was 19.89±2.36, respectively, with min/max of 18/25 years in both groups. The analysis indicated that 50% of female participants were aged ≥19 years [median (IQR)=19(18-21)], while among male participants, 50% were aged ≥18 years[median (IQR)=18(18-19)]. The analysis showed no significant difference between sexes with regard to age, according to the Mann Whitney U test: Z=1.011; p=0.3119 (Table 1 and Figure 1).

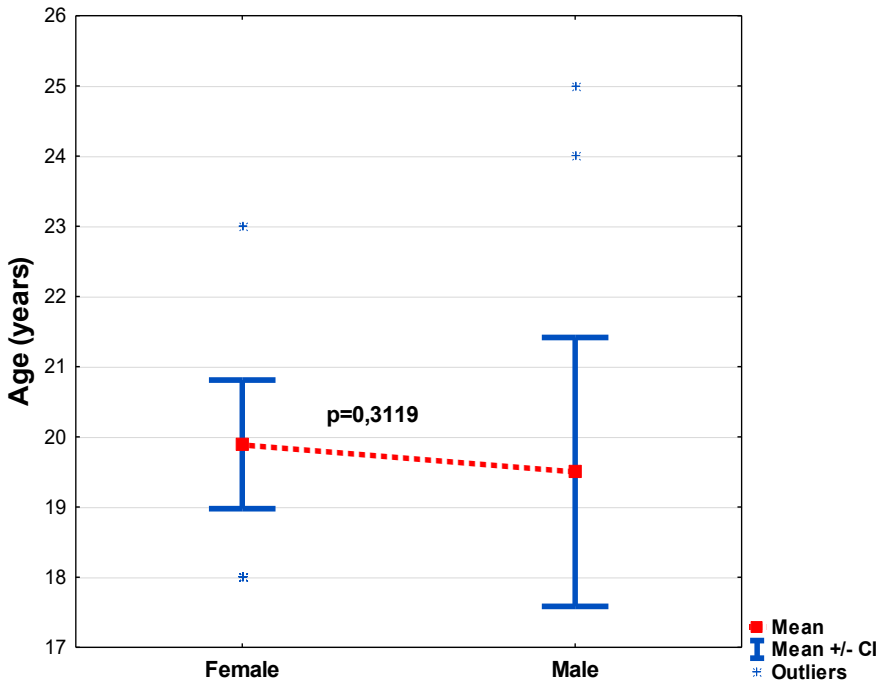

Fig. 1. Distribution of participants by sex and age (years)

The participants were analyzed according to the IOTN classification across 5 categories (Table 2 and Figure 2).

Table 2. Distribution of participants according to IOTN classification and sex

Parameters	Sex			Ratio	p
	Women N (%)	Men N (%)	Total N (%)		
IOTN classification					
IOTN 1	-	-	-	-	
IOTN 2	8(28.57%)	1(10%)	9(23.68%)	8:1	
IOTN 3	8(28.57%)	2(20%)	10(26.32%)	4:1	p=0.7
IOTN 4	8(28.57%)	6(60%)	14(36.84%)	1.3:1	235
IOTN 5	4(14.29%)	1(10%)	5(13.16%)	4:1	
Total	28(7.68%)	10(26.32%)	38(100%)	-	

Fisher Freeman - Halton Exact test, *significant for p<0.05

Individual analysis showed that 9(23.68%) participants in the overall sample were classified as IOTN 2 (mild anomaly, no treatment needed), including 8(28.57%) male and 1 (10%) female participant. The borderline category, IOTN 3 (treatment may or may not be necessary), was identified in 10 participants (26.32%), including 8(28.57%) female and 2(20%) male participants. IOTN 4 (treatment needed) was identified in 14 participants (36.84%), including 8(28.57%) female and 6(60%) male participants. Finally, IOTN 5(urgent need for

treatment) was identified in 5 participants (13.16%), including 4 (14.29%) female and 1(10%) male participant (Table 2 and Figure 2).

No significant association was found between sex and IOTN classification (p=0.7235) (Table 2 and Figure 2).

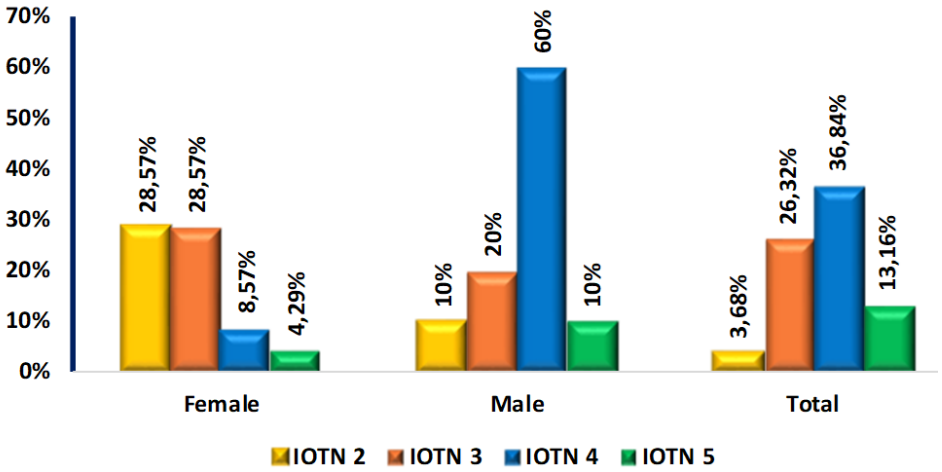

Fig. 2. Distribution of participants according to IOTN classification and sex

Table 3. Distribution of participants according to IOTN classification and age

Parameters	Age				**p**
	Mean ±SD	Min/Max	Median (IQR)	Number (N)	
IOTN classification					
IOTN 1	-	-	-	-	
IOTN 2	20.44±2.88	18/25	20(18-21)	9	
IOTN 3	18.80±0.42	18/19	19(19-19)	10	$X^2_{(3.\ N=38)}$=8.938
IOTN 4	19.57±2.50	18/25	18(18-20)	14	p=0.0301*
IOTN 5	21.20±3.27	18/25	21(18-24)	5	
Total	19.79±2.42	18/25	19(18-21)	38	

X^2=Kruskal-Wallis H test, *significant at p<0..05

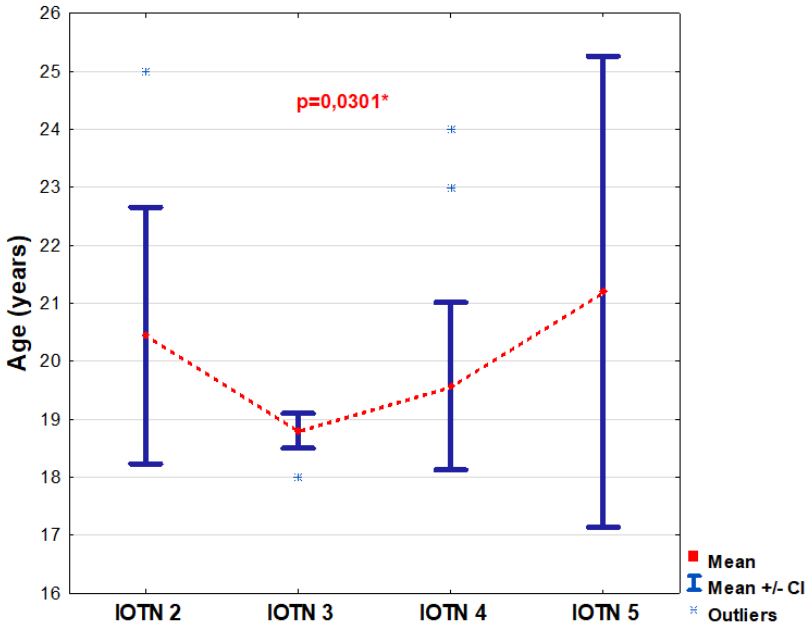

Fig. 3. Distribution of participants according to IOTN classification and age

The graphical representation of the distribution of participants according to IOTN classification and age is given in Figure 3.

The individual analysis detected a significant difference among the 5 IOTN classifications with regard to participants' age(p=0.0301). A significantly lower mean age of 18.80±0.42 years was found among participants with IOTN 3-borderline case, treatment may or may not be necessary, while a significantly higher mean age of 21.20±3.27 years was found among patients with IOTN 5-urgent need for treatment (Table 3 and Figure 3).

Discussion

According to recent literature, the IOTN index remains a reference instrument for assessing orthodontic treatment need, as it enables a standardised classification of malocclusion severity based on its aesthetic and functional components. These findings emphasise the need to integrate the index into everyday clinical practice, particularly when planning and prioritising orthodontic interventions.

The findings obtained in this study indicated an objective need for orthodontic treatment (IOTN 4 and 5) in half of the participants aged 18 to 25 years, with 13.16% having an urgent need for intervention. In comparison, a considerably lower prevalence of severe or extreme orthodontic treatment need (24.3%) was documented in Saudi young adults, where crowding (48.8%) and increased overjet (21.8%) were the leading occlusal anomalies[14]. Whereas our study identified a high prevalence, the literature consistently reports lower proportions of pronounced or definite treatment need among Asian adult males and young adults in Peru[9,12]. Our results are closer to those of Salonen *et al*.,[13], who found a substantial prevalence of treatment need in a Swedish adult population, indicating that pronounced malocclusion is a significant public health problem even in developed European countries, not only in populations with limited access to preventive and early orthodontic care. The divergence between our findings and those reported in the literature is likely to be explained primarily by methodological factors - differences in sample selection, inclusion criteria, and the geographic and sociocultural contexts of the examined populations.

A notable finding of our study is the markedly uneven sex distribution of the sample, with 73.68% female and 26.32% male participants. This likely reflects women's greater health awareness and more frequent use of dental and orthodontic services, plausibly driven by a stronger concern for aesthetic appearance.

Mean age differed significantly across the five IOTN categories, ranging from approximately 19 years in participants with a borderline treatment need (IOTN 3) to approximately 21 years in those with an extreme treatment need (IOTN 5). This raises the hypothesis that treatment need may worsen over time in individuals who did not seek timely intervention at a younger age, and therefore older participants may present with longer-standing, untreated malocclusion.

The findings also have public health relevance, suggesting that systematic screening for early identification of malocclusion in adolescence, with timely referral for orthodontic consultation, may reduce the number of adults with untreated, severe malocclusion. In settings with limited healthcare resources, priority setting based on objective indices such as the IOTN-DHC may allow more efficient allocation of available capacities, which is consistent with the role of the IOTN as a standardized instrument for assessing orthodontic need[15].

Conclusion

Among young adults aged 18-25 years, half had a severe or extreme need for orthodontic treatment. Age was significantly associated with treatment need, but no significant differences were observed by sex. These findings emphasise the importance of objective assessment and may help inform treatment prioritisation and resource allocation.

Conflict of interest statement. None declared.

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