APPLICATION OF IOTN AND DAI INDICES FOR ASSESSMENT IN NEED OF ORTHODONTIC TREATMENT

ПРИМЕНА НА IOTN И DAI ИНДЕКСИ ЗА ПРОЦЕНКА ВО ПОТРЕБА НА ОРТОДОНТСКИ ТРЕТМАН

Radeska - Panovska A.[1], Jankulovska M.[2], Gjorgievska E.[2], Carcheva – Shalja S.[1]

[1]Faculty of Medical Sciences, Goce Delcev University of Shtip, Shtip, Republic of North Macedonia, [2]Department of Pediatric and Preventive Dentistry, Faculty of Dental Medicine, University "Ss Cyril and Methodius", Skopje, Republic of North Macedonia

Abstract

Communication in human population is realized through the appearance, symmetry and regularity of the face, which is connected with aesthetics and personal self-esteem. Therefore, there is a need for a beautiful smile in everyday life regardless of the age of the population. Due to the more frequent requirement of patients to improve their smile in everyday clinical practice, therapists face aesthetic requirements of patients, on the one hand and functional balance of the entire facial part, on the other. Our research showed the self-assessment of respondents in stricter terms and criteria in relation to the obtained objective finding. The positive correlation between the DH IOTN and the DAI index was confirmed, but it also proved that the degree of malocclusion assessed by the DH component of the IOTN does not cor-relate with the degree of self-assessment of the subjects through the AC (aesthetic) component of the IOTN index. An important segment in the self-evaluation of the respondents for their "orthodontic anomaly" depends on the level of education of the parents. Respondents with highly educated parents were more critical in self-assessment compared to respondents who indicated high or low education of their parents. **Key words:** IOTN, DAI, incides, orthodontic treatment, aesthetics

Апстракт

Комуникацијата во хуманата популација се реализира преку изгледот, симетријата и правилноста на лицето, што е поврзано со естетиката и личната самодоверба. Од таму и потребата од убава насмевка претставува секојдневие независно на возраста во популацијата. Поради се почестото барање на пациентите за подобрување на нивната насмевка во секојдневната клиничка пракса терапевтите се соочуваат со естетските барања на пациентите од една страна и функционална рамнотежа на целиот фацијален дел од друга страна. Нашето истражување го покажа самооценувањето на испитаниците во построги рамки и критериуми во однос на добиениот објективен наод. Се потврди позитивната корелација помеѓу DH IOTN и DAI индексот, но и се покажа дека степенот на малоклузија оценет со DH компонента од IOTN не корелира со степенот на самооценување на испитаниците преку AC (естетска) компонента од IOTN. Важен сегмент во самооценувањето на испитаниците за нивната „ортодонтска аномалија" заземa степенот на образование на родителите. Испитаниците со високо образовани родители беа покритични во самооценувањето во однос на испитаниците кои за своите родители навеле средно или ниско образование. **Клучни зборови:** IOTN, DAI индекси, ортодонтски третман, естетика

Introduction

Today, the desire and the need of patients for an aesthetically beautiful smile have imposed the requirement for a normative determination of the true need for orthodontic treatment, which as such, will contribute to skeletal, dental and soft tissue balance within normal occlusion. Because orthodontic treatment is complex, long-lasting and expensive, an appropriate patient selection protocol is required (this is emphasised in public healthcare where treatment is covered by the Health insurance fund) that there is a real need, not just a wish for a beau-tiful smile without underlining the function of the dentist. The imperative of every dentist is the harmonization of the aesthetic moment and the proper function of the orophacial system. Although there is no absolute consensus on the individual and occlusal characteristics to be assessed, in order to objectively determine the need for orthodontic treatment, in the contemporary literature, indices on the need for orthodontic treatment used in epidemiological studies of malocclusion, in different countries tend to comply on a number of levels, to equate the criteria and to be recognized by various international associations[1]. One of those indices is the Index of

Orthodontic treatment need, described by Brook and Shaw (1989) and modified by Richmond (1990) as a method for objectively assessing the need for orthodontic treatment. This index is also used to assess the need and the patient's eligibility for orthodontic treatment in public healthcare[2]. The first part of this index is Dental Health Component (DHC), is composed of 5 degrees:

1st degree - almost perfect dentition, no treatment is needed

2nd degree - minimal irregularities

3rd degree - major irregularities that do not require treatment

4th degree - more serious irregularities requiring treatment

5th degree - more serious dental problems, treatment is needed

The second part of the IOTN is the Aesthetic Component (AC) which is a scale of 10 colour photos showing various levels of dental abnormalities. This part of the IOTN index is used when the patient is assessed to have 3rd degree deviations according to the Dental Health Component (DHC).

To assess the need for orthodontic treatment, the Dental Aesthetic Index (DAI), adopted as an international index, is recommended by the World Health Organization, and its accuracy and validity is documented in a number of studies[3,4,5]. With this parameter, an evaluation of 10 occlusal features is carried out: tooth loss, overjet, negative overjet, median diastema, width of the anterior irregularities (mandible and maxilla), anterior open bite, anterior crowding, anterior diastema and antero-posterior spring relationship. The DAI index evaluates 4 degrees of malocclusion severity: a score lower than or equal to 25 (no or slight treatment needed), a score between 26 and 30 (treatment of choice), a score between 31 and 35 (a great need for treatment), and score higher than 36 (treatment without exception)[3].

These enclosed indexes, IOTN and DAI, contain aesthetic and clinical criteria and they accept the premise that the significant benefit of orthodontic treatment refers to improved aesthetics and ultimately social and psychological well-being.

The treatment decision is particularly challenging for the orthodontists, when malocclusion is at the borderline treatment level, and the patient's desire is mainly due to aesthetic corrections[6].

In order to determine the need for orthodontic treatment, as well as to provide insight into the concept of acceptable occlusion, a number of epidemiological studies have been performed for dental defects in different countries over the last two decades.[7] At present, however-er, generally accepted criteria that they will define from an orthodontic aspect, normality or abnormality with regard to occlusal status[7]. The goal of orthodontic treatment is to achieve the desired aesthetics with an improved function[8]. In 2001, Beglin et al. makes a comparison of the IOTN and DAI index with a number of orthodontic therapists and summarize that these two parameters are credible measures to assess the need for orthodontic treatment[8].

According to the findings of Hlongwa et al. in 2004, both indices can be used continuously to identify the need for orthodontic treatment in different ethnic groups[9]. In most studies, both indices (IOTN and DAI) are used together to evaluate the representative sample and compare the results obtained[10].

Dogan et al.[11] found that there is a significant correlation between DHC and an estimate of an IOTN by the orthodontist, which means that the orthodontist's ability to perceive the patient's disorder is more precise and comprehensive than that in terms of the orthodontic clinical skills.

Of all the previous studies and trials that have been made in order to obtain a response to the true need for orthodontic treatment, results have been obtained that support the aesthetics or function. All this points to the necessity of further investigations that will determine the need for orthodontic treatment based on aesthetic indices on the one hand and noticed occlusal contacts on the other.

The actuality of the problem, the more frequent use of orthodontic appliances and their representation in children and youth, require clarification and a clear definition of the need for orthodontic treatment.

This research will be conducted in order to analyse and determine the condition of the patient's dentition assessed by the DH component of the IOTN index and the DAI index and subjects will be self-assessed according to the aesthetic component of the IOTN index.

We shall assess the percentage of the match between the self-assessment of the respondents and the objective estimate with the IOTN and DAI indices, to see if there is a difference between gender self-esteem and by which percentage it is represented.

Material and methods

For the realisation of the goals of this paper, 80 adolescents, aged between 16 and 18, will be examined with equal gender representation.

The survey will include only subjects without an orthodontist apparatus (fixed or removable).

The choice of this category of examinees coincides with the age where permanent dentition is present, and at

the same time, it coincides with the period of self-consciousness, conscientiousness and attention they dedicate to the physical appearance, the smile and the dental situation.

The design of the study consists of several components:

- Questionnaire (interview),
- Self-assessment of respondents according to the aesthetic component of the IOTN index,
- Taking an imprint of the respondents with a print-out,
- Filling out the printouts and obtaining workstation models in the laboratory and analysis of the DH (dental component) IOTN index and DAI index

The first part of the questionnaires (Figure 1) contains the basic data of respondents (number of questionnaire, name and surname and date of birth), then the education of the parents (high, secondary, elementary education), occupation (manager of a company or a private business-man, a civil servant and occasionally employed or unemployed).

The second part of the questionnaires will note: the self-assessment of respondents according to AC from the IOTN index, objective finding according to DH (dental component) of the IOTN index and the DAI index.

In the second part, each respondent will receive the 10 photos that represent the aesthetic component of the IOTN Index (Figure 2) and each of them will be self-assessed according to one of those ten photos.

Every examinee will be taken an anatomical imprint with the Alligat Heraeus printout, and the next stage will be spilled into the dental laboratory to obtain a studio model for further analysis and evaluation.

On the obtained studio models, an analysis of all irregularities in sagittal, transversal and vertical aspect as well as notifying the irregularities of individual teeth will be performed. Measurements in mm will be done with a CPI probe for that purpose. Regarding the results, the respondents will be categorized from the 1st to the 5th degree according to the DH (dental component) of the IOTN index.

Once the measurements of the studio models are executed and the values are based on the DAI index (Table 1), they will be mathematically calculated by adding and finally added constant of the DAI index, which is 13. Thus, the obtained value will be compared to what extent the DAI index belongs.

Four degrees of malocclusion severity:

- Score less than or equal to 25 (no or slight treatment needed),
- Score between 26 and 30 (optional treatment),
- Score between 31 and 35 (a great need for treatment), and
- Score higher than 36 (treatment without exception).

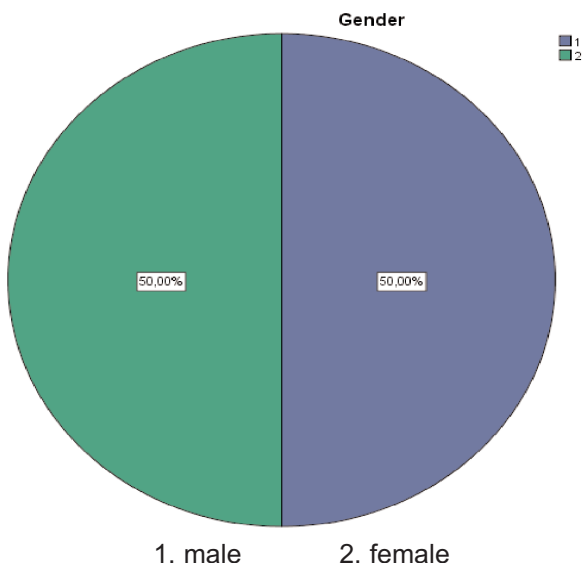**Table 1.** The standard DAI regresion equation.

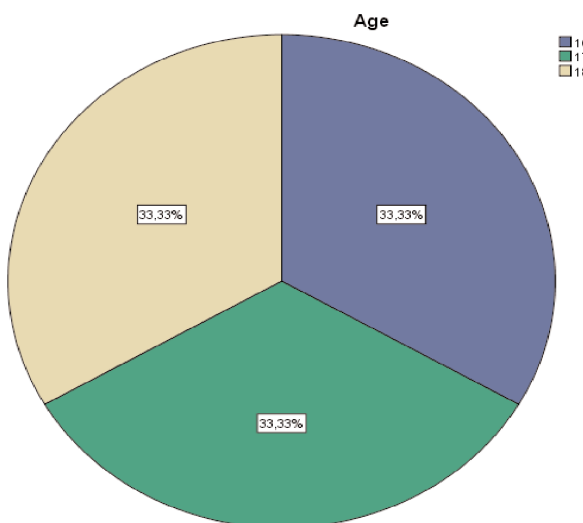| DAI Components	Weight
1. Number of missing visible teeth (incisors, canines and premolars teeth in maxillary and mandibular arches).	6
2. Crowding in the incisal segment (0=no segment crowded; 1=1 segment crowded; 2=2 segments crowded).	1
3. Spacing in the incisal segment (0=no spacing; 1=1 segment spaced; 2=2 segment spaced).	1
4. Midline diastema in millimeters.	1
5. Largest anterior irregularity on the maxilla in millimeters.	1
6. Anterior maxillary overjet in millimeters.	2
7. Anterior mandibular overjet in millimeters.	4
8. Vertical anterior openbite in millimetrs.	4
9. Anterior-posterior molar relation (largest deviation from normal either left or right): 0=normal; 1=1/2cusp either mesial or distal; 2=one full cusp or more either mesial or distal.	3
10. Constant.	13
Total	**DAI score**

WHO, 1997.

Results

The total number of respondents in this study was 30, with equal distribution of sex and age (16, 17, 18) (Graphs 1 and 2) and different level of education of the parents (Graph 3).
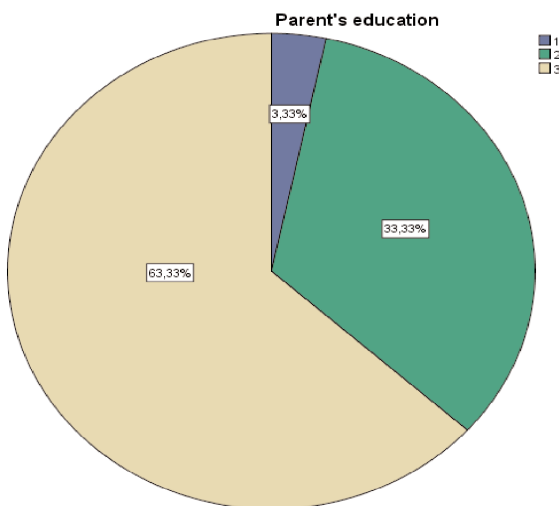
This study showed that the degree of malocclusion assessed by the DH component of the IOTN has a significant statistical value with the degree of self-assessment of the respondents through the AC (aesthetic) component of the IOTN. At the same time, it confirmed the positive correlation between DH IOTN and the DAI index.

1. Elementary 2. Secondary 3. Higher education
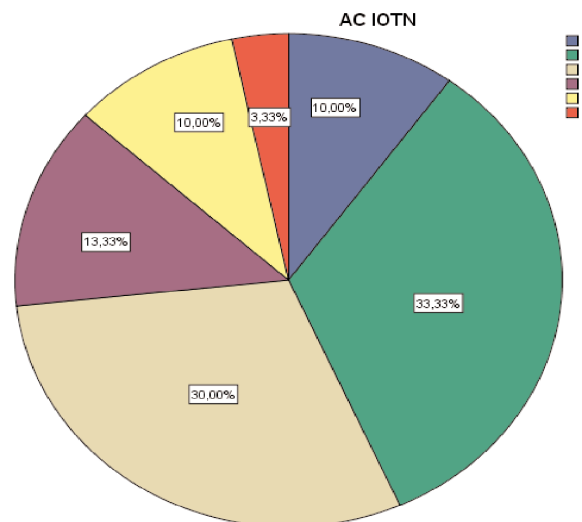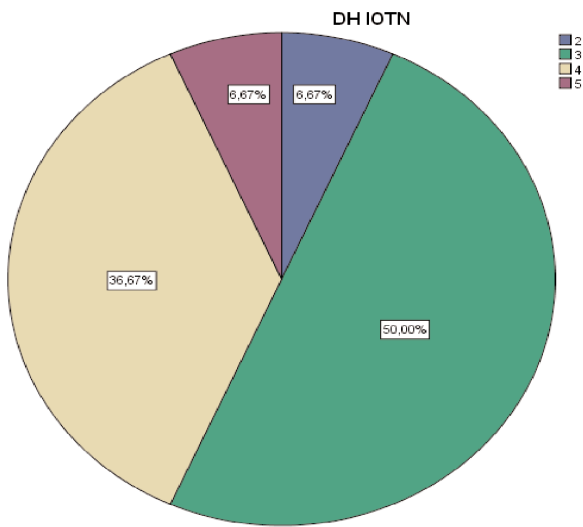
Graph 3. Degree of education of the parents of the respondents

Most of them (10) or 33.30% were rated with a photo (grade 3) of AC from the IOTN index, and only one (3.30%) of the respondents was rated with a degree (photo) 7 (Figure 4). Abdullah M S, Rock W P 9 received a score indicating that 47.9% of their respondents were rated grade 4 and 5 of DH IOTN and 22.8% with grade 8-10 of AC IOTN.

1. male   2. female

Graph 1. Gender representation of respondents

Graph 4. Self-assessment of respondents according to AC IOTN

Graph 2. Age representation of respondents

15 respondents or 50% gave objective assessments with grade 3 according to DH IOTN, i.e. major irregularities that do not require treatment (Figure 5).

Македонски стоматолошки преглед. ISSN 2545-4757, 2019; 42 (1-2): 54-59.

57

DH IOTN

Graph 5. An objective finding according to DH IOTN

17 respondents or 56.70% gave objective assessments with degree 2 according to the DAI Index or Optional Treatment (Figure 6), and only 2 respondents or 6.70% with degree 4. Considering that degree 3 and degree 4 indicate a clear need for orthodontic treatment, the percentage of respondents who needed it was 21.2% of the research done by D. Manzanera et al.

DAI

Graph 6. Objective findings according to the DAI index

Pursuant to our research and results, we can see that there is a significant statistical value (p <0.05) between AC IOTN and DH IOTN (Table 2), results that correlate with research done by other researchers[12].

Table 2. Frequency and percentage expression of all parameters

N=30		Frequency	Percentage
Age			
	16 y	10	33%
	17 y	10	33%
	18 y	10	33%
Gender			
	Male	15	50%
	Female	15	50%
Parent's education			
	Elementary	1	3.30%
	Secondary	10	33.30%
	High	19	63.30%
Self-assessment with AC IOTN			
	2	3	10%
	3	10	33.30%
	4	9	30%
	5	4	13.30%
	6	3	10%
	7	1	3.30%
Objective findings with DH IOTN			
	2	2	6.70%
	3	15	50%
	4	11	36.70%
	5	2	6.7%
Objective findings with DAI			
	2	17	56.70%
	3	11	36.70%
	4	2	6.70%

Table 3. Correlation between AC IOTN and DH IOTN

		AC IOTN	DH IOTN
AC IOTN	Pearson Correlation	1	,496**
	Sig. (2-tailed)		,005
	N	30	30
DH IOTN	Pearson Correlation	,496**	1
	Sig. (2-tailed)	,005	
	N	30	30

Table 4. Correlation between *AC IOTN and Parent's education*

		AC IOTN	*Parent's education*
AC IOTN	Pearson Correlation	1	,328
	Sig. (2-tailed)		,077
	N	30	30
DH IOTN	Pearson Correlation	,328	1
	Sig. (2-tailed)	,077	
	N	30	30

Table 3 shows the correlation between AC IOTN and the parent's education, which although there was a tendency for positivity during the test itself, after statistical processing we obtained p> 0.05, that is, this correlation is not statistically significant.

Discussion

Out of the total number of respondents (30) with equal distribution of gender and age (16, 17, 18) and different education level of the parents, most teenagers (10) or 33.30% were evaluated with a photo degree 3 of AC from the IOTN index, and only one (3.30%) of the respondents was rated with degree (photo) 7. Abdullah M.S., Rock W.P. received a score indicating that 47.9% of their respondents were rated degree 4 and 5 of AC IOTN and 22.8% with degree 8-10 of AC IOTN[10]. 15 respondents or 50% gave objective assessments with degree 3 according to DH IOTN, with major irregularities that no treatment is needed for. Abdullah M. et al. obtained a result which showed that 57.9% of their respondents were rated with degree 5 of DH IOTN. 17 respondents or 56.70% were objectively assessed with grade 2 according to the DAI Index or Optional Treatment, and only 2 respondents or 6.70% with degree 4. Considering that degree 3 and degree 4 indicate a clear need for orthodontic treatment, the percentage of respondents who needed it was 21.2% of the research done by D. Manzanera et al.[1] The correlation between AC IOTN and the parents' education, which although showed a positive tendence during the test itself, after the statistical processing we obtained p> 0.05, that is, this correlation is not statistically significant. In Dogan A.A at al.[11] research results obtained showed that education and socio-demographic characteristics have an impact in self-evaluation.

From the studies we have so far, we have come to the conclusion that the greatest motive for visiting the orthodontist is aesthetics. This study showed the self-assessment of the examinees in stricter terms and criteria in relation to the obtained objective findings. In a complex situation, such as the decision to orthodontic treatment, the therapist is right before a real challenge. On the one hand, we have respondents who have a desire for a more beautiful smile and a strong motive, but without a true indication of it (on the basis of some of the indexes). On the other hand, we have respondents with a real need for treatment, but who are not aware of the same need. The HIF of the Republic of North Macedonia is paying the costs for a mobile orthodontic device up to 18 years of age for the patient. The question is whether this money is used properly? In order to have a successful treatment, the patient's motive and cooperation is of the primary importance.. On the other hand, the indices are a quite clear indicator about which patients need orthodontic treatment.

Reference

1. Manzanera D, Montiel-Company JM, Almerich-Silla JM and Gandía JL. Diagnostic agreement in the assessment of orthodontic treatment need using the Dental Aesthetic Index and the Index of Orthodontic Treatment Need, Eur J Orthod 2009 Oct 32(2):193-8.
2. Brook P, Shaw W. Eur J. Orthod 1989; 309-320.
3. Otuyemi OD, Noar JH. A comparison between DAI and SCAN in estimating orthodontic treatment need. Int Dent J. 1996 Feb; 46(1):35–40.
4. Jenny J, Cons NC. Comparing and contrasting two orthodontic indices, the Index of Orthodontic Treatment need and the Dental Aesthetic Index. Am J Orthod Dentofacial Orthop. 1996 Oct; 110(4):410–416.
5. Rues S, Schindler HJ, Turp JC, Schweizerhof K, Lenz J. Motor behavior of the jaw muscles during different clenching levels. Eur J Oral Sci. 2008; 116(3):223.
6. Graber LW, Lucker GW. Dental aesthetic self-evaluation and satisfaction. Am J Orthod 1980; 77: 163-173.
7. Ciuffolo F, Manzoli L, D'Attilio M, Tecco S, Muratore F, Festa F, Romano F. Prevalence and distribution by gender of occlusal characteristics in a sample of Italian secondary school students: a cross-sectional study, Eur J Orthod 2005; 27 601–606.
8. Beglin FM, Firestone AR, Vig KW, Beck FM, Kuthy RA, Wade DA. Comparison of the reliability and validity of 3 occlusal indices of orthodontic treatment need. Am J Orthod Dentofacial Orthop. 2001;120: 240–246.
9. Hlongwa P, Beane RA, Seedat AK, Owen CP. Orthodontic treatment needs: comparison of two indices. S. Afr. dent. j. 2004; 59: 421–424.
10. Abdullah MS, Rock WP. Assessment of orthodontic treatment need in 5112 Malaysian children using the IOTN and the DAI. CDH 2001; 18: 242–248.
11. Dogan AA, Sari E, Uskun E, Saglam AMS. Comparison of orthodontic treatment need by professionals and parents with different socio demographic groups. Eur. J. Orthod. 2010 Dec; 32(6):672-6.
12. Siddiqui TA, Shaikh A. Agreement between orthodontist and patient perception using Index of Orthodontic Treatment Need, Saudi Dent J. 2014 Oct; 26(4): 156–165.

Македонски стоматолошки преглед. ISSN 2545-4757, 2019; 42 (1-2): 54-59.

59