Index of orthodontic treatment need in children from the Niš Region

Indeks potrebe za ortodontskim lečenjem kod dece niškog regiona

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Abstract

Background/Aim. The Index of Orthodontic Treatment Need (IOTN) is a scoring system for malocclusion that consists of the two independent components: Denal Health Component (DHC) and Aesthetic Component (AC). IOTNs are usually used in the countries with dental healthcare financed by the government through the national healthcare system or healthcare insurance. The aim of the study was to determine IOTN in primary school children from the town of Niš and to asses percent of children with any kind of orthodontic treatment. **Methods.** The study involved 301 school children, 11–14 (12.4 ± 1.1) years old. The IOTN was used by the two examiners in order to evaluate the treatment need. **Results.** The results of the study showed that 111 (37%) out of 301 examined children had orthodonic treatment (33.33% boys and 66.67% girls) and they were excluded from the study. Out of final sample of 190 school children, considering DHC of the IOTN, 27.4% of the children showed great (grades 4–5), 41.0% moderate (grade 3) and 31.6% slight or no treatment need (grade 1–2). Considering IOTN AC, 15.3% of the children showed great (grade 8–10), 24.3 % moderate (grade 5–7) and 60.4% slight or no treatment need (grade 1–4). **Conclusion.** The need for orthodontic treatment in school children in the town of Niš, Serbia, is similar to the need in most European countries, despite the fact that the number of children orthodontically treated is much higher compared to most of European countries.

Key words:
orthodontics, corrective; malocclusion; child; data interpretation, statistical.

Apstrakt

Uvod/Cilj. Indeks potrebe za ortodontskim lečenjem (IOTN) je indeks za procenu izraženosti malokluzija koji se sastoji od dve nezavisne komponente: komponente zdravlja zuba (DHC) i estetske komponente (AC). Indeks IOTN najčešće se primenjuje u zemljama u kojima se stomatološka služba finansira od strane države preko zdravstvenih fondova i sistema zdravstvenih institucija. Cilj ovog rada bio je da se odredi IOTN kod dece iz osnovnih škola u Nišu i da se utvrdi procenat dece koja imaju istoriju ortodontskog lečenja. **Metode.** Studijom je bilo obuhvaćeno 301 dete, uzrasta od 11 do 14 godina, koje su ispitala 2 ispitivača. **Rezultati.** Rezultati istraživanja pokazali su da je 111 (37%) ispitane dece imalo istoriju ortodontskog lečenja (33,33% dečaka i 66,67% devojčica) i oni su bili isključeni iz studije. Od preostale 190 dece, na osnovu analize DHC IOTN 27,4% imalo je veliku (stadijum 4–5), 41,0% umerenu (stadijum 3) i 31,6% malu ili nikakvu potrebu (stadijum 1–2) za ortodontskim tretmanom. Analizom AC IOTN 15,3% ispitane dece imalo je veliku (stadijum 8–10), 24,3% umerenu (stadijum 5–7) i 60,4% malu ili nikakvu potrebu (stadijum 1–4) za ortodontskim tretmanom. **Zaključak.** Indeks IOTN kod dece iz Niša sličan je onom kod dece u većini evropskih država, uprkos činjenici da je broj dece koja su ortodontski lečena u Nišu znatno veći nego u evropskim zemljama.

Ključne reči:
ortodoncija, korektivna; malokluzija; deca; statistička interpretacija podataka.

Introduction

In the Republic of Serbia, Healthcare Fund provides free mobile appliances for orthodontic treatment for children under 18. Orthodontic treatment with fixed appliances will be charged depending on the institution in which the treatment is carried out. In the City of Niš, in public institutions, generally, there are waiting lists for orthodontic treatment with mobile appliances. Waiting time for the treatment is from two to three months.

The orthodontic treatment is not obligatory and it depends on personal desires of children and their parents. Thus, educating parents and children in this sense even in primary schools, would certainly contribute to rising the awareness

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among parents and children about the existing orthodontic irregularities. It would influence the increment of the number of patients who request orthodontic treatment. Assessment of the severity of malocclusion and estimating the need for treatment is not always easy and depends on many factors: age, gender, dentition, knowledge, and experience of the orthodontist, but of course also on the financial situation of patients [1].

Many studies are dealing with the assessment of the need of orthodontic treatment by patients and orthodontists [2–6]. There is a significant difference in the assessment of patients and specialists in orthopedics of jaws, except when it comes to very severe forms of irregularities.

The first quantitative method for the assessment of malocclusion was developed by Massler and Frankel in 1951 [7]. Since then a large number of occlusal indexes was developed. Several contemporary orthodontics methods are used for assessing the severity of malocclusion, such as: Index of Orthodontic Treatment Need (IOTN) [4], Peer Assessment Rating Index (PAR) [8] and the Index of Complexity, Outcome and Need (ICON) [9]. The IOTN and ICON are most commonly used. The results of the measurement needs for treatment obtained by these methods in certain ethnic groups largely coincide [10]. The IOTN is due to its simplicity more frequently used especially among researchers from the Middle East [11–15].

The IOTN is a scoring system for malocclusion, developed by Brook and Shaw [4] in 1989. It consists of the two independent components. The Dental Health Component (DHC) is a five-grade index that records the dental health need for orthodontic treatment. The Aesthetic Component (AC) records the aesthetic need for orthodontic treatment using a ten-grade standardized ranking scale of colored photographs showing different levels of dental attractiveness.

These indexes are usually used in the countries with dental healthcare financed by the government through the national healthcare system or healthcare insurance (Denmark, Finland, Norway, and Great Britain). The leading idea is to take care of patients with severe orthodontic anomalies first and to limit the free of charge orthodontic services to severe cases of malocclusions. This can considerably narrow the waiting list [3].

Up to now, in the city of Niš there were no studies on the IOTN. The aim of this study was to determine the IOTN among children from the city of Niš aged 11–14 and to find the percentage of children with the history of orthodontic treatment. The results would help determine the facts about the prevalence of malocclusion and the efficiency of the existing healthcare services.

Methods

The study was approved by the Ethical Committee of the Faculty of Medicine, University of Niš, Serbia. With the help of schoolteachers, families of the examined children were contacted to obtain authorisation.

We examined 301 children, from 4 primary schools in Niš (139 boys and 162 girls). Their average age was 12.4 ± 1.1 years. A group of 111 children of the initial sample was excluded from the study because of a previous or current orthodontic treatment. The final sample included 190 school children, 102 boys and 88 girls. Their average age (± standard deviation) was 12.28 ± 1 years. The sample was chosen in order to give us reliable data for school children population from Niš.

The two orthodontists were collecting data. Before starting investigation, the necessary calibrations using plaster models were done with the examiners to provide the validity of the results. The clinical examinations were performed in school dental ordinations. In one session not more than 20 children were examined to avoid tiredness of the examiners. Following the World Health Organization (WHO) criteria and recommendations for oral health examinnations, WHO – type periodontal probe and No. 5 plain mouth mirror were used. The used indices were IOTN, DHC, and AC. The DHC consists 5 grades. Grade 1 and 2 represent slight or no treatment need, grade 3 moderate and grade 4 and 5 represent great need of orthodontic treatment. AC consists a scale of 10 color photographs showing 10 levels of dental attractiveness starting with most attractive dentition (grade 1). Grade 1 to 4 represent slight or no treatment need, grades 5 to 7 moderate and grades 8 to 10 represent great need for orthodontic treatment.

To test intra-examiner agreement, 65 of the referred population were re-examined, 6 weeks after their initial examination. The assignment of grades was also done by two examiners to test inter-examiner agreement. Kappa statistics [16] was used to evaluate the consistency of both intra-examiner and inter-examiner agreement.

The data were recorded on examination record forms and processed and stored in the access database. Statistical analysis was undertaken using the Statistical package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 12.0. We analised the IOTN results regarding gender using the χ^2-test. The differences greater than ($p < 0.05$) were considered statistically significant.

Results

The kappa values of the intra-examiner reproducibility for the DHC and AC were 0.88 and 0.80, respectively. On the other hand, the kappa values of the inter-examiner for the DHC and AC were 0.84 and 0.78.

The distribution of the results of the orthodontic treatment need in relation to DHC IOTN is shown in Table 1. Considering DHC IOTN 27.4% of school children from Niš showed great (grades 4–5), 41.0% moderate (grade 3) and 31.6% slight or no treatment need (grade 1–2). There were no statistically significant gender differences in the determined treatment need using the DHC ($\chi^2 = 1.78$; $p = 0.183$). The distribution of the results of the orthodontic treatment need in relation to the AC IOTN is shown also in Table 1. Considering the IOTN AC, 15.3% of school children from Niš showed great (grade 8–10), 24.3 % moderate (grade 5–7) and 60.4% slight or no treatment need (grade 1–4). No statistically significant gender differences in treatment need determined using the AC were found ($\chi^2 = 0.37$; $p = 0.543$).

Table 1
Influence of gender on Dental Health Component (DHC) and Aesthetic Component (AC) of treatment need frequency
[expressed as Index of Orthodontic Treatment Need (IOTN) grade]

IOTN component (grade)	Male (n = 102) n (%)	Female (n = 88) n (%)	Total (n = 190) n (%)
DHC*			
1 and 2	32 (31.5)	28 (31.8)	60 (31.6)
3	38 (37.3)	40 (45.4)	78 (41.0)
4 and 5	32 (31.4)	20 (22.7)	52 (27.4)
AC†			
1–4	55 (54.5)	59 (67.0)	114 (60.4)
5–7	29 (28.7)	17 (19.3)	46 (24.3)
8–10	17 (16.8)	12 (13.6)	29 (15.3)

χ^2 = 1.78; p = 0.183; χ^2 = 0.37; p = 0.543 (no statistically significant gender differences).
*grade: 1–2 – slight or no treatment need; 3 – moderate treatment need; 4 and 5 – great treatment need
† grade: 1–4 – slight or no treatment need; 5–7 moderate treatment need; 8–10 great treatment need.

Discussion

The conducted study is one of the first epidemiological studies on malocclusions using IOTN on the territory of the town of Niš. The obtained results allow comparisons with the other regions of Serbia as well as with the results obtained in Europe and other parts of the world. The present results are not totaly representative because of the fact that 37% of the examined children had the history of orthodontic treatment and they were excluded from the study.

In this study, the intra-examiner kappa values were 0.88 and 0.80 for the DHC and AC, respectively. The intra-examiner kappa values were 0.84 and 0.78 for the DHC and AC, respectively. When these values were analyzed, almost perfect agreement was obtained for the DHC and substantial agreement for the AC.

Taking into consideration IOTN DHC, our result of 27.4% of the children with the great need for orthodontic treatment is similar to the results obtained in the Southern Italy, (27.3%) [17], and in Spain, (21.8%) [18], while substantially smaller than those obtained in Sweden (37%) [19], Turkey (38.8%) [20] and Malaysia (47.9%) [21]. Significantly lower DHC IOTN value is found in Iran (18.4%) [22] and the Western Sahara (18.1%) [23]. According to AC IOTN our results 15.3% of the children with the great need for orthodontic treatment is similar to those obtained in the Western Sa-hara [23] (13.7%), while higher values are obtained in Malaysia (22.8%) [21]. Most of the authors, however, received very low values of AC IOTN: in Iran 8.7% [22], Spain 4.4% [18], Turkey 4.8% [20], Sweden 2.3% [19]. In our study there are no gender differences in the distribution of the orthodontic treatment need. These results are in the line with the results of many studies [17, 20, 23].

The percentage of children with the history of ortho-dontic treatment (37%) is incredibly high compared to the results obtained in the Western Europe [18, 24, 25]. In the UK the percentage of orthodontically treated children aged 15–16 is 14%, France 2.4%, and 26.6% in Spain. This is a fact which is important to know when interpreting the results obtained after determining the IOTN only in children who did not have the history of orthodontic treatment.

Conclusion

The use of the Index of Orthodontic Treatment Need in epidemiological studies can be useful for comparing the need for orthodontic treatment in different populations and planning and improving the healthcare system of the society. The need for orthodontic treatment in school children in the town of Niš, Serbia, is similar to the need in most European countries, de-spite of the fact that the number of children orthodontically treated is much higher as compared to European countries.

R E F E R E N C E S

1. *Djordjević J, Šćepan I, Glišić B*. Evaluation of agreement and correlation of three occlusal indices in an assessment of orthodontic treatment need. Vojnosanit Pregl 2011; 68(2): 125−9. (Serbian)
2. *Burden DJ, Pine CM*. Self-perception of malocclusion among adolescents. Community Dent Health 1995; 12(2): 89−92.
3. *Tulloch JF, Shaw WC, Underhill C, Smith A, Jones G, Jones M*. A comparison of attitudes toward orthodontic treatment in British and American communities. Am J Orthod 1984; 85(3): 253−9.
4. *Brook PH, Shaw WC*. The development of an index of orthodontic treatment priority. Eur J Orthod 1989; 11(3): 309−20.
5. *Burden DJ, Pine CM, Burnside G*. Modified IOTN: an orthodontic treatment need index for use in oral health surveys. Community Dent Oral Epidemiol 2001; 29(3): 220−5.
6. *Hamdan AM*. The relationship between patient, parent and clinician perceived need and normative orthodontic treatment need. Eur J Orthod 2004; 26(3): 265−71.
7. *Massler M, Frankel JM*. Prevalence of malocclusion in children aged 14 to 18 years. Am J Orthod 1951; 37(10): 751−68.
8. *Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD,* et al. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod 1992; 14(2): 125−39.
9. *Daniels C, Richmond S*. The development of the index of complexity, outcome and need (ICON). J Orthod 2000; 27(2): 149−62.
10. *Fox NA, Daniels C, Gilgrass T*. A comparison of the index of complexity outcome and need (ICON) with the peer assessment rating (PAR) and the index of orthodontic treatment need (IOTN). Br Dent J 2002; 193(4): 225−30.

11. *Abu Alhaija ESJ, Al-Nimri KS, Al-Khateeb SN.* Self-perception of malocclusion among north Jordanian school children. Eur J Orthod 2005; 27(3): 292−5.

12. *Grzywacz I.* The value of the aesthetic component of the Index of Orthodontic Treatment Need in the assessment of subjective orthodontic treatment need. Eur J Orthod 2003; 25(1): 57−63.

13. *Kerosuo H, Al Enezi S, Kerosuo E, Abdulkarim E.* Association between normative and self-perceived orthodontic treatment need among Arab high school students. Am J Orthod Dentofacial Orthop 2004; 125(3): 373−8.

14. *Mugonzibwa EA, Kuijpers-Jagtman AM, van, t Hof MA, Kikwilu EN.* Perceptions of dental attractiveness and orthodontic treatment need among Tanzanian children. Am J Orthod Dentofacial Orthop 2004; 125(4): 426−33.

15. *Al-Sarheed M, Bedi R, Hunt NP.* Orthodontic treatment need and self-perception of 11-16-year-old Saudi Arabian children with a sensory impairment attending special schools. J Orthod 2003; 30(1): 39−44.

16. *Agresti A.* Categorical Data Analyses. New York: John Wiley & Sons; 1990.

17. *Perillo L, Masucci C, Ferro F, Apicella D, Baccetti T.* Prevalence of orthodontic treatment need in southern Italian schoolchildren. Eur J Orthod 2010; 32(1): 49−53.

18. *Manzanera D, Montiel-Company JM, Almerich-Silla JM, Gandía JL.* Orthodontic treatment need in Spanish schoolchildren: an epidemiological study using the Index of Orthodontic Treatment Need. Eur J Orthod 2009; 31(2): 180−3.

19. *Josefsson E, Bjerklin K, Lindsten R.* Malocclusion frequency in Swedish and immigrant adolescents: influence of origin on orthodontic treatment need. Eur J Orthod 2007; 29(1): 79−87.

20. *Uçüncü N, Ertugay E.* The use of the Index of Orthodontic Treatment need (IOTN) in a school population and referred population. J Orthod 2001; 28(1): 45−52.

21. *Abdullah MS, Rock WP.* Assessment of orthodontic treatment need in 5,112 Malaysian children using the IOTN and DAI indices. Community Dent Health 2001; 18(4): 242−8.

22. *Hedayati Z, Fattahi H, Jahromi SB.* The use of Index of Orthodontic Treatment Need in an Iranian population. J Indian Soc Pedod Preven Dent 2007; 25(1): 10−4.

23. *Puertes-Fernández N, Montiel-Company JM, Almerich-Silla JM, Manzanera D.* Orthodontic treatment need in a 12-year-old population in the Western Sahara. Eur J Orthod 2011; 33(4): 377−80.

24. *Chestnutt IG, Burden DJ, Steele JG, Pitts NB, Nuttall NM, Morris AJ.* The orthodontic condition of children in the United Kingdom, 2003. Br Dent J 2006; 200(11): 609−12.

25. *Souames M, Bassigny F, Zenati N, Riordan PJ, Boy-Lefevre ML.* Orthodontic treatment need in French schoolchildren: an epidemiological study using the Index of Orthodontic Treatment Need. Eur J Orthod 2006; 28(6): 605−9.