Index of Complexity, Outcome and Need (Icon) for Determining Treatment Need in The Northern Border Region of Saudi Arabia: An Epidemiological Study

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Research Article

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Abstract

Background: Assessment of orthodontic treatment need is a complicated issue. As integral part of oral health care programs, Orthodontic treatment needs to be based on information of treatment needs. The evaluation of malocclusion is the essential component in establishing the diagnosis and treatment need of the orthodontic patient. Taking decision of whether or not one should undergo orthodontic treatment, both the desire of the patient (and/ or parents) and the opinion of the orthodontist must be taken into account. One of the major problems in studying malocclusion is the availability of a suitable objective method for recording the occurrence and severity of orthodontic problem. Thus, orthodontic indices are used in clinical and epidemiological studies of malocclusion. The aim of this study is to determine the necessity and complexity of orthodontic anomalies by applying Index of Complexity, Outcome and Need (ICON) in Saudi population.

Methods: A descriptive cross-sectional study was conducted on dental casts of 150 patients (mean age 15.66 ± 1.07) adolescents randomly selected from the northern border region of Saudi Arabia (KSA). Index of Complexity Outcome and Need (ICON) was applied to find out the orthodontic treatment need and initial stage complexity grades. The data was performed using the statistical software package IBM SPSS Statistics 24.0.

Results: 80% of the patients needed some sort of orthodontic therapy. More than 65% of the cases were classified as being difficult and very difficult to treat.

Conclusion: It was concluded that a high number of cases were in need of the orthodontic therapy and majority of the patients undergoing orthodontic treatment were in difficult grades.

Background

The demand for orthodontic treatment has increased over the past few years together with a rise in awareness of esthetics. Orthodontic index is defined as assigning a mathematical numeric grade to a patient's occlusion. When accurate epidemiologic studies are done with in the society and treatment needs are well clarified, the policy making for treatment and designating human and financial resources can then be formulated, implemented and allocated respectively [1].

Various indices are developed hitherto for an objective measurement of the necessity for treatment despite the very fact that there is no universally accepted measure for assessment of orthodontic treatment need [2].

Recently, another index has been developed that assesses the treatment need, severity of malocclusion, and treatment outcome and as such offers significant advantages over other indices of treatment need which is named as the Index of Complexity, Outcome and Need (ICON). The ICON weightings are based on the opinion of an international panel of 97 orthodontists from nine countries. [3]

The Index of Complexity and Orthodontic treatment Need has been shown to be a reliable and valid index for assessing orthodontic treatment need in other populations [2–5]. It is employed in the late mixed dentition and permanent dentition. Also the index may be applied clinically to cases and to plaster models without any changes. The ICON has special provision of including the aesthetic score as main part for advocating treatment need. The aesthetic component of the IOTN, cross bite, upper arch crowding or spacing, overbite or open bite, and buccal segment antero-posterior relationship are used to determine treatment need, treatment outcome, complexity, and degree of improvement [2]

It has been shown in the previous studies that geographic location may affect the specialist's determination of treatment need and outcome [5, 6]. Evidence in medicine is there that treatment provision differs by geographic location, despite the fact that prevalence of the underlying disease does not vary [7–9]. Thus it is important to validate an index which shows correctly identify treatment need with the suggestions of orthodontic specialists who are practicing within that particular geographic location [2, 3].

In the past many studies are conducted and various orthodontic indexes are being proposed to search out treatment need and to mark complexity of patient's malocclusion [2–7]. The index of orthodontic treatment need (IOTN), Peer assessment rating (PAR) and the index of complexity, outcome, and need (ICON) are perhaps the most commonly used orthodontic indexes [8–10].

However there are certain shortcomings of PAR index and the IOTN, [11–14] which are insignificant correlation between indices, contradictory findings, valid in United Kingdom only, undue flexible for end treatment spaces, no scoring for incisor inclination and rotations, and do not grade difficulty of treatment. Until now no study has been conducted in Saudi population on ICON, however, many studies have been conducted in Saudi population on other indices [15–19].

The aim of the study was to epidemiologically assess orthodontic treatment need and complexity grades, in orthodontic patients with chronological ages of 14 to 18 years in kingdom of Saudi Arabia using the ICON index. The null hypothesis is that no significant differences in ICON scores among Saudi population as a function geographic/ethnic background.

Methods

Study population

This cross-sectional study was conducted among the people of Northern border, KSA who report for orthodontic treatment at university staff dental clinic Jouf University.

Inclusion Criteria was all teeth present except third molars, Orthodontic patients with chronological ages of 14 to 18 years, good quality pre-treatment models and Saudi national.

Exclusion Criteria was Previous Orthodontic / Orthognathic treatment, Craniofacial syndromes and patients with Temporomandibular joint problems.

Data Collection:

The study was conducted at the University staff dental clinic, College of Dentistry Jouf University, Saudi Arabia from august 2020 to November 2020. Ethical approval for study protocol was obtained from Local Committee of Bioethics (LCBE), Jouf University before initiating the study. All the procedures were performed according to ethical norms and standards mentioned in the Declaration of Helsinki.

Informed consent was obtained from the patient on forms in Arabic and English and if the patient is below 18 years old (minor) the informed consent was obtained from the parents or guardian of the patient.

Stratified cluster sampling technique was used for data collection. Participants were selected from patients who visit for orthodontic treatment. Initially, Sakaka town was stratified into two zones, from each zone a cluster was selected by simple random (lottery) method and participants were selected proportionately using serpentine method until the fulfilment of required samples from each cluster using inclusion and exclusion criteria's.

Orthodontic records of 150 untreated patients, between the chronological ages of 14 and 18 years, irrespective of gender were included. The records included alginate impression of maxillary and mandibular arches which were poured in white hard plaster (Elite ortho zhermak). The data was collected on a data collection proforma. Dental models were used and analyzed by applying ICON to find out the orthodontic treatment need and initial stage complexity grades. The aesthetic component was graded according to the aesthetic component scale of IOTN [10].

Converted scores was multiplied by weighting factors as prescribed in the literature, i.e., crowding weight 5, cross bite weight 5, incisor overbite weight 4, incisor open bite weight 4, and each right and left sides buccal anteroposterior relationship weight 3 [20].

Statistical Analysis: Statistical data analysis was performed using the statistical software package IBM SPSS Statistics 24.0. The mean age and gender distribution among the selected sample were calculated. For Intra examiner reliability, 25 dental casts was randomly selected from the main sample and was reassessed 10 days after the initial assessment.

ICON complexity grades (Score range) are as follows [10].

Easy <29

Mild 29 to 50

Moderate 51 to 63

Difficult 64 to 77

Very difficult >77

Good clinical practice: All the procedures mentioned in this study protocol, relating to the conduct, outcome assessment and documentation of this study, are designed to ensure that the study abide by LCBE.

Confidentiality of the data: Confidentiality will be maintained and participants’ information will not be disclosed without their consent.

Results

The mean age of the patients was 14.18 years. The sex distribution was 60 males and 90 females. The mean age of male patients was 14.11 years and mean age of female patients was 14.13 years. (Table 1)

Forty study casts (80%) were found to be in need of orthodontic treatment, while 10 (20%) were found to be having no need of treatment. It had been found that, out of 30 females 23 needed treatment and 7 were found, having no need of treatment. 17 males were found to be in need of treatment and 3 were found, having no need of treatment. (Table 2)

As far as the orthodontic pre-treatment complexity grade is concerned, maximum number of cases 35% were classified as having very difficult treatment (ICON score > 77). 5% cases in easy treatment grade (ICON score < 29), 5% cases in mild treatment grade (ICON scores from 29 to 50), 25% in moderate treatment grade (ICON scores from 51 to 63), and 30 % in difficult treatment grade (ICON scores from 64 to 77). (Table 3)

TABLE 1: AGE AND SEX DISTRIBUTION (N=150)

Parameter	Results
Mean Age	15.66 Years
Males	60
Females	90

TABLE 2: RESULTS OF TREATMENT NEED (N=150)

		Treatment Need		Total
		Yes	No	
Gender	Male	51	9	60
	Female	69	21	90
Total		120	30	150

TABLE 3: RESULTS OF TREATMENT COMPLEXITY GRADES (N=100)

Complexity Grade	% of patients
Easy <29	5
Mild 29 to 50	5
Moderate 51 to 63	25
Difficult 64 to 77	30
Very difficult >77	35

Discussion

Orthodontic treatment, as integral part of oral health care programs need to be based on information of treatment needs. The evaluation of malocclusion is the essential component in establishing the diagnosis and treatment need of the orthodontic patient. One of the major problems in studying malocclusion is the availability of a suitable objective method for recording the occurrence and severity of orthodontic problem. Thus, orthodontic indices are used in clinical and epidemiological studies of malocclusion.

Many studies have been conducted in Saudi population on other studies but study on ICON has not yet been done. Even though the need for orthodontic treatment has been evaluated using the ICON score in some ethnic groups, the importance of validating this index is still in debate before it can be employed as an extensive epidemiologic assessment tool in Saudi Arabia. We are now able to categorize the orthodontic patients on the basis of severity which will help us to reduce the work load on our dental health services like ministry of health and universities staff dental clinics and also the treatment for different severity categories will be prioritized.

The benefits of grading complexity of occlusion are Identification of the most proper clinical setting in which orthodontic patient receives therapy, Information to the patient regarding orthodontic therapy success chances, and grade cases according to difficulty. The ICON consists of five components: The Aesthetic Component which is similar to the Aesthetic Component of the IOTN, upper and lower crowding and or spacing, the presence or absence of crossbite, grading of overbite, and the buccal segment antero posterior relationship [10].

Results of present study showed that 80% were in need of orthodontic treatment, while 20% were found to be having no need of orthodontic treatment. It was found that, out of 150 patients 120 needed orthodontic treatment and 30 were found to be in need of orthodontic treatment. As far as the orthodontic pre-treatment complexity grade is concerned, maximum number of cases i.e. 65% were classified as having difficult and very difficult orthodontic treatment grades.

Results of present are study higher than other studies in Jordan (28%), Kuwait (28%), United Kingdom (32%), New Zealand (31.3%), Malaysian (47.9%) and Chinese (52%) populations. Contrary to our findings, some African studies, reported much lower estimates for Nigerian (13%) and Tanzanian children (22%) [20-27]. However, our results are in agreement with other local studies [28-32]. In terms of orthodontic treatment need, there was substantial agreement between the gold standard and the ICON index and thus the ICON index seems to be a viable Index to substitute the IOTN [33].

Conclusion

It was concluded that, according to ICON, a high number of cases were in need of the orthodontic therapy and majority of the patients undergoing orthodontic treatment were in difficult grades.

Abbreviations

PAR: Peer Assessment Rating; ICON: Index of complexity, outcome and need; IOTN: Index of Orthodontic Treatment need; KSA: Kingdom of Saudi Arabia.

Declarations

Ethics approval and consent to participate (informed consent)

The study protocol was reviewed and ethical clearance was obtained before the start of the study from the Ethical approval Committee of College of Dentistry, Jouf University, KSA The parent or guardian of the child provided the consent on behalf of the patient.

Consent for publication:

Written consent was given by the parent or guardians and author's to publish anonymized data

Availability of data and materials:

The data sets used and/or analyzed during the current study are available from the corresponding authors on reasonable request.

Competing interests:

The authors declare that they have no competing interests

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Author's contribution:

Ibadullah Kundi as single author wrote the manuscript, took the impressions for the models, collect the data on the proforma and prepared all the tables.

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