“QUALITY ASSESSMENT OF ORTHODONTIC TREATMENT USING ICON INDEX (INDEX OF COMPLEXITY, OUTCOME AND NEED) - A CROSS-SECTIONAL STUDY”

By

Dr. PREETHI S

Reg. No. II0219004

Dissertation

Submitted to

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IN

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(BRANCH – V)

Under the Guidance of

Dr. ROOPA JATTI M.D.S

DEPARTMENT OF ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

KLE VISHWANATH KATTI INSTITUTE OF DENTAL SCIENCES,

KAHER, BELAGAVI, KARNATAKA.

JUNE – 2021

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Date:

Place: Belagavi

Dr. ROOPA JATTI M.D.S.
Professor,
Department of Orthodontics &
Dentofacial Orthopaedics,
KLE Vishwanath Katti
Institute of Dental Sciences,
KAHER,
Belagavi-590010.

KAHER, BELAGAVI

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Head of Department

Dr. Tejashri Pradhan M. D.S.
Professor & Head,
Department of Orthodontics and
Dentofacial Orthopaedics,
KLE Vishwanath Katti
Institute of Dental Sciences,
KAHER, Belagavi.

Date:
Place: Belagavi

Principal

Dr. Alka Kale M. D.S.
Principal,
KLE Vishwanath Katti
Institute of Dental Sciences,
KAHER, Belagavi.

Date:
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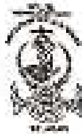

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☎: 0831-2470362 Web: http://www.kledental-bgm.edu.in
FAX: 0831-2470640 E-mail:principal@kledental-bgm.edu.in

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UG / PG / Ph.D / Staff : POSTGRADUATE STUDENT
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Department : ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS

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Nehru Nagar, Belagavi 590 010 INDIA

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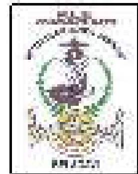

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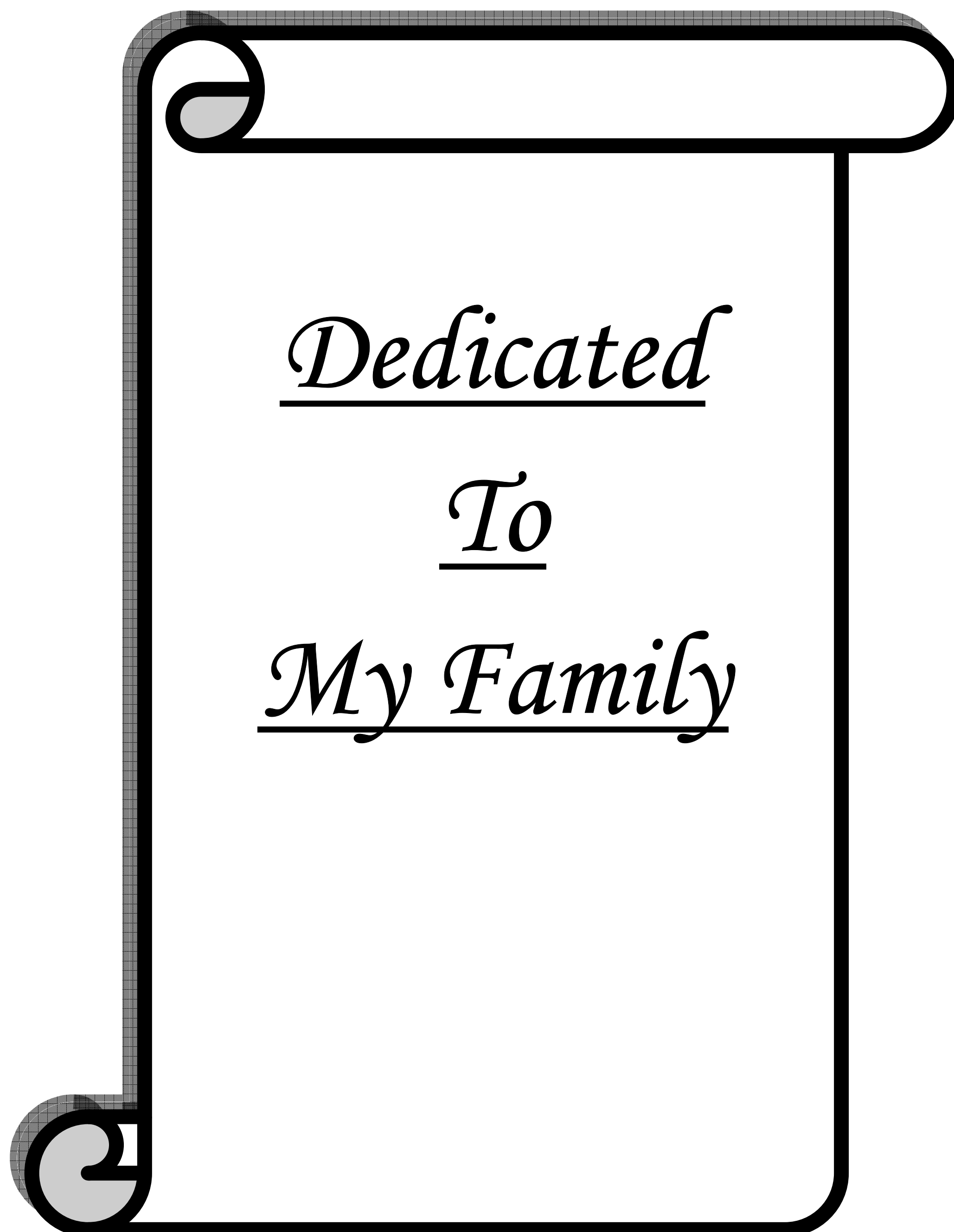
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Dr. Preethi S

LIST OF ABBREVIATIONS

ICON	-	Index of Complexity, Outcome and Need
IOTN	-	Index of Treatment need and Outcome
PAR	-	Peer Assessment Rating scale
DAI	-	Dental Aesthetic Index
ABO	-	American Board of Orthodontics -
OGS	-	Objective Grading System
OHRQoL	-	Oral Health Related Quality of Life

ABSTRACT

BACKGROUND:

The evaluation of malocclusion is very essential as they play a very important role in diagnosis and also to identify the treatment need of the patient. One of the serious issues in examining malocclusion is the accessibility of an appropriate technique for recording the event and seriousness of orthodontic issue. Several indices have been developed to evaluate the prevalence and severity of malocclusion like Dental Aesthetic index (DAI), Peer Assessment Rating (PAR), Index of Orthodontic treatment Need (IOTN).

Studies have shown that there is no single index that has been created and validated to assess treatment need, complexity and outcome. An exertion has been made by C. Daniels and S. Richmond, to frame a unified index ICON, so as to utilize the same measurement tool to assess the treatment need, treatment outcome and complexity.

Thus, this study helps us to assess the quality of treatment of orthodontic cases treated in the department based on the ideal scores as prescribed by ICON index. Based on the results, scope for enhancing the quality of treatment in long run will be considered.

MATERIALS AND METHODS:

Cross sectional study was conducted on patients who have undergone orthodontic treatment in the department for the past 5 years using ICON index (Index of Complexity,Outcome and Need).

RESULTS:

This study showed 87% indicates the need for orthodontic treatment and 13% indicates no need of orthodontic treatment. In our study, out of 150 samples 5% were easy, 37% were mild, 26% were moderate, 18% were difficult, 13% were very difficult.

Among 5% of the easy cases 3% were greatly improved and 2% were substantially improved. Out of 37% of mild cases, 19% were greatly improved, 16% were substantially improved and 2% were minimally improved. And 26% of the cases were moderate, out of which 10% of the cases were greatly improved, 13% were substantially improved and 3% were minimally improved. Among 18% of the difficult cases, 13% were greatly improved and 5% were substantially improved. And 13% of the very difficult cases, 8% were greatly improved and 5% were substantially improved

CONCLUSION:

The above mentioned information gives a bird's eye view of the treatment done by the PG's done in the department. This information can be used to evaluate patient satisfaction, and also for self-assessment for the Orthodontist. At the same time, it also provides data for scope of improvement, to identify the problems associated with less than satisfactory improvement, and to look for smarter ways to curb for these problems.

ICON index can be used as an self assessment tool which would help to increase the quality of the orthodontic treatment. The approach to establish a successful orthodontic treatment could be drastically different for the patient and for

the orthodontist. A technically good treatment from an orthodontist’s perception, might not be satisfactory to the patient, and vice versa. It is imperative for an Orthodontist to take time to understand patient needs, identify their expectations and provide a unique tailored treatment plan for each patient to achieve the right balance between patient satisfaction and technically sound treatment, which should be considered a successful orthodontic treatment.

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INTRODUCTION

Malocclusion is a universal dental problem that affects individuals to different degrees. According to the Dental Practice Board, the term 'malocclusion' is defined as "an abnormal occlusion in which teeth are not in normal position in relation to adjacent teeth in the same jaw and/or the in the opposite arch when the mouth is closed". Orthodontists describe it as "an appreciable deviation from ideal occlusion".[1]

The evaluation of malocclusion is very essential as they play a very important role in diagnosis and also to identify the treatment need of the patient. One of the serious issues in examining malocclusion is the accessibility of an appropriate technique for recording the event and seriousness of orthodontic issue. [2]

The technique for recording malocclusion can be characterized into qualitative and quantitative strategies. Qualitative technique portrays the characterization of the dentition, anyway doesn't give any data of the treatment need and result. Example: Angle's classification. Whereas, quantitative techniques measure the complexity and seriousness of the issue evaluated in a scale or extent. They are utilized to prioritize the treatment need for the patient. Also they help in the assessment of outcome and complexity of the orthodontic treatment. Example: Indices (IOTN,PAR,ICON)[3]

Orthodontic indices are intended to quantify the seriousness of malocclusion, either as a deviation from normal malocclusion or as far as orthodontic treatment need, which can be utilized in clinical and epidemiological investigations of malocclusion. [4]

Several indices have been developed to evaluate the prevalence and severity of malocclusion. Indices like Dental Aesthetic index (DAI) [5], Peer Assessment

Rating (PAR)[6], Index of Orthodontic treatment Need (IOTN) [7] have been used in orthodontics to assess the treatment need and outcome.

Treatment need indexes like DAI, IOTN are used to determine orthodontic need based on aesthetic impairment, potential for adverse effect on dental health, and deviation from normal occlusion. Outcome indexes like PARare used to measure occlusal changes during treatment. In addition to treatment-need indexes and outcome indexes, some authors have suggested the need for a complexity index [8]

Studies have shown that there is no single index that has been created and validated to assess treatment need, complexity and outcome.

An exertion has been made by C.Daniels and S.Richmond, to frame a unified index ICON, so as to utilize the same measurement tool to assess the treatment need, treatment outcome and complexity.[9] The Index of Complexity, Outcome, and Need (ICON), in view of the impression of 97 orthodontists from 9 nations, has been proposed as a multipurpose occlusal list. ICON is dependent on the normal assessment of an enormous board of universal orthodontic conclusions.[10]

ICON utilizes a portion of the highlights of IOTN and PAR which comprises five weighted measurements (Aesthetic component of IOTN; presence of a crossbite, anterior vertical relationship, upper arch crowding/spacing; buccal segment antero-posterior relationship measured by PAR), the total of which are deciphered with cutoff esteems to demonstrate treatment need, complexity, improvement and adequacy. [11]

ICON was created in eight European nations and in the United States and is apparently more legitimate than the PAR and IOTN.13 High legitimacy of the ICON

has been accounted for and a few European investigations have indicated great dependability.[12]

As ICON index has good validity and reliability, it fills in as outstanding amongst other methods for recording the occurrence and severity of the orthodontic problem.[13,14]

The ICON has also been accepted as a valid tool for use in epidemiological studies and is simple to use, which requires only a millimeter ruler and an Aesthetic Component Scale. The index can be used both in the late mixed dentition and permanent dentition. Further, the index might be applied clinically to patients and to casts with no modifications. The ICON index incorporates an aesthetic score which is an integral part in the assessement of patients treatment need, which is why it is considered as an unique index.Since it is both a record of treatment need and an occlusal file of malocclusion seriousness, the ICON offers huge preferences over different lists of treatment need.[14]

The claimed advantages of ICON are that it is simple to use, requires no hierarchy, measures relatively few traits, and can be used on patients or study casts without modifi cation. The index is valid for the assessments of treatment need, complexity, and outcome and avoids the need to use different indices to make different forms of assessment.[15]

Thus, this study helps us to assess the quality of treatment of orthodontic cases treated in the department based on the ideal scores as prescribed by ICON index. Based on the results, scope for enhancing the quality of treatment in long run will be considered.

AIM & OBJECTIVES

AIM OF THE STUDY:

To evaluate the treatment need,outcome and complexity of the orthodontic treatment using ICON (Index of Complexity, Outcome and Need) in the pre and post treatment models.

OBJECTIVES:

- To evaluate the treatment need using ICON index in the pre treatment models
- To evaluate the treatment complexity using ICON index in the pre treatment models
- To evaluate the treatment outcome using ICON index in the post treatment models

REVIEW OF LITERATURE

- **Louwerse TJ, Aartman IH, Kramer GJ, Prahl-Andersen B et al** authenticated the ICON for its need in the netherlands for treatment by connecting it to the Dutch Orthodontist's opinion, and the index's dependability was investigated, for both the Calibrated and non-calibrated orthodontists. Among the Calibrated orthodontists and the non-calibrated orthodontists, there was a substantial difference in the ICON score, which is predominantly based on the Aesthetic Component of the IOTN. It can be stated that when determining the treatment need in the Dutch Orthodontic population, ICON needs to be altered.[13]
- **Sepide Torkon et al** verified the Index of Complexity, Outcome and Need and surveyed various ethnic groups in Iran whether it is valid for measuring both the complexity and need of the orthodontic treatment. In terms of the need for orthodontic treatment, there was a tangible agreement between the ICON index and the gold standard, and thus suggesting that the ICON index could potentially replace the IOTN index. While ICON is a valid index in Iran for determining the need for orthodontic treatment, the index's complexity component has not been validated in our country. As a result, in our society, there is currently no validated index for determining the complexity of orthodontic treatment.[11]
- **N. A. Fox, C. Daniels and T. Gilgrass** assessed the correspondence between PAR, IOTN and ICON for exhibiting whether these indices could be replaced by ICON as the measure of complexity, outcome and need for the orthodontic treatment. The researchers found that ICON reflecting the opinion of the UK and thus the PAR and IOTN may be effectively replaced as the means of resolving need and outcome.[5]

- **Chukwudi Ochi Onyeasoa and Ellen A Begoleb** calculated the relationships between four indexes - The index of Complexity, Outcome and Need, Peer Assessment Rating Index (PAR), Dental Aesthetic Index (DAI), and American Board of Orthodontics - Objective Grading System (ABO-OGS) that are used to gain orthodontic treatment need and outcome and to regulate whether one index could replace other three. The researchers finally stated that ICON can be used instead of PAR and ABO-OGS for evaluating treatment outcome and in the place of DAI for evaluating treatment need. [16]
- **Renata vidakovic et al** assessed the association among Dental Aesthetic Index and Index of Complexity, Outcome and Need. The calculation of the need of orthodontic treatment for school children in a population with two indices, that is separately for school children with mixed and permanent detention. Because of the presence of the caries and/ or gingivitis, The population estimation shares that could not receive the orthodontic treatment. The Researchers found that DAI and ICON indexes have modest agreement in calculation of malocclusion severity scores. Around one third of school children with different degrees of both DAI and ICON indexes have gingivitis and half the population have caries.[10]
- **María Fernanda et al** utilized the ICON index in response to the need for information on severity of malocclusion and perceived orthodontic treatment needed in the international scientific community. The Aesthetic component of IOTN and ICON index assist clinicians to examine the treatment need in consonance with various parameters. The researchers finally came to the conclusion that both indexes may be employed to examine the orthodontic treatment need.[4]

- **Ali Borzabadi et al** evaluated the agreement between the index of complexity, outcome and need and the index of orthodontic treatment need assessments of orthodontic treatment need. They found that there was better consensus between the ICON and DHC of IOTN. The best replacement for the DHC of the IOTN is the ICON. [18]
- **Emine Kaygisiz et al** evaluated the consensus among the Index of Complexity, Outcome and Need and the Dental Aesthetic Index in assessment of need for orthodontic treatment and to examine connection among Peer Assessment Rating and DAI and ICON scores in consonance with Classification of angle among patients assigned for orthodontic evaluation. The DAI, ICON and PAR bring out identical results and can be utilized interchangeably for the general orthodontic patient population.[12]
- **Olkun HK et al** calculated the correlation between Oral Health Related Quality of Life (OHRQoL) and orthodontic treatment complexity using ICON index and to calculate the impact of orthodontic treatment and malocclusion on OHRQoL in orthodontic patients regarding gender and age. The Researchers found that orthodontic treatment enhances OHRQoL. Orthodontic treatment complexity does not make quite an impact on OHRQoL.[12]
- **Kalantari M et al** administered a cross sectional study in an Iranian school children population to calculate certain parameters using Index of Complexity, Outcome and Need. They found that there was no significant difference in means of complexity grade between genders and age groups, and that half of the cases studied required treatment, with nearly one-fifth having a difficult or very difficult complexity grade, indicating the need for specialist care.[20]

- **Ogutii et al** actuated needs of treatment and patients difficulties in Istanbul according to orthodontic clinics in state and foundation universities in consonance with the ICON and to assess the treatment coverage extent by the SSI. The Researchers came to a conclusion that nearly one third of patients in both universities were determined as "No Treatment" and in terms of reproducibility, the ICON index was considered to be a reliable index. [21]
- **Videkovic R et al** assessed the relationship among the Index of Complexity, Outcome and Need and the Dental Aesthetic Index. The analysis of school children's orthodontic treatment needs using two indexes, separately for school children with mixed and permanent dentition. The population estimation conveys that they could not obtain orthodontic treatment due to the existence of caries and/or gingivitis. They found that ICON and DAI indexes have mediocre agreement in calculating malocclusion severity scores and one third of school children using different degrees of both ICON and DAI indexes have gingivitis and half the population have caries.[11]
- **Sepp H et al** used Index of Complexity, Outcome and Need to examine data on occlusal traits, need for orthodontic treatment, and treatment complexity in 390 orthodontically untreated young adults, which included first molar and canine sagittal relationship, crossbite, overbite, overjet, crowding, midline diastema and scissor bite. The opinions of participants concerning their teeth were resolved with a questionnaire. The Researchers found that the desire over orthodontic treatment was linked with several factors like crowding and increased overjet, no gender difference. Needs for the treatment calculated using ICON were moderate and it is in line with desire of the participants for orthodontic treatment.

Improvement in the dentofacial aesthetics is the main expectation of the treatment.[12]

- **Liausas R et al** evaluated the existence of orthodontic problems for school age patients and to resolve the need for orthodontic treatment, complexity and outcome who were treated at clinic of orthodontics LUHS. They found that the orthodontic treatment needed among subjects treated from 2013 to 2018 in the clinic of orthodontics LUHS is 56.3 percent. Among all age groups, the treatment complexity is mostly "easy" or "mild".[13]
- **Templeton KM et al** examined two occlusal indexes which were most relevant for use in the valuation of orthognathic outcome. The Index of treatment, complexity, outcome and need and the Peer assessment rating index were the indexes used. They found that both ICON and PAR are indexes suitable for calculating the clinical outcome of orthodontic treatment and orthognathic surgery combinedly. [4]
- **Ngom PI et al** evaluated the subjective need using the Aesthetic Component of Index of Orthodontic Treatment Need and the Dental Health Component and Index of Complexity, Outcome and Need, perception of and demand for orthodontic treatment were calculated with a questionnaire. Only one tenth of the children had certain knowledge of orthodontics. Anyhow, between 17% and 30% of the children distinctly conveyed the orthodontic treatment need and distribution among the ethnic groups was evident. In contradiction, there were no evident gender differences regarding this treatment demand.[17]
- **Ren Y et al** examined the normative knowledge of patients seeking orthodontic retreatment as well as the objective treatment need and complexity. One hundred patients seeking re-treatment were asked to complete a questionnaire based on 15

patient pilot interviews. Treatment experiences, retention processes following the initial course of treatment, and expectations and motives for re-treatment were all included in the questionnaires. The Researchers employed a visual analogue scale (VAS 0-10). By age, gender, and the date of the first consultation, the re-treatment group was matched to an untreated control group. According to the research models of both groups, Patients seeking re-treatment had a favourable assessment of strong motivation, dental aesthetics and an objective treatment need, which were rated using the Index of Complexity, Outcome and Need.[15]

- **Chukwudi et al** assessed the orthodontic treatment services given by a North American graduate orthodontic clinic. According to the ICON, 86 instances required orthodontic treatment, with 60 cases deemed difficult or very difficult to treat. Only five situations were deemed simple. There were 82 cases that were significantly and much improved, and 5 cases that were only marginally better. There was only one example that fell into the "no improvement/worse" category. A total of 94 finishers were deemed acceptable.[17]

MATERIALS AND METHODS

STUDY DESIGN

Cross sectional study was conducted on patients who have undergone orthodontic treatment in the department

SOURCE OF DATA

The patients reported to the Department of Orthodontics and Dentofacial Orthopaedics, KLE Academy of Higher Education and research, (KAHER) KLE V.K. Institute of dental sciences, Belagavi for orthodontic treatment were included in the study. All the patients had met the following criteria:

INCLUSION CRITERIA

- Subjects having completed orthodontic treatment in the past 5 years in the Department of Orthodontics at , KLE Academy of Higher Education and research, (KAHER) KLE V.K. Institute of dental sciences, Belagavi.
- Completed debonded fixed orthodontic treatment cases selected by simple random sampling method

EXCLUSION CRITERIA

- Patients who have undergone cleft surgery
- Patients who have undergone orthognathic surgery
- Patients with syndromes

SAMPLE SIZE ESTIMATION

Sample size

Pre-test mean = 70.7

Post-test mean = 53.3

Standard deviation in Pre-test= 22.35

Standard deviation in Post-test = 19.25

Effect size = -0.836538461538462

Power (%) = 95

Alpha Error (%) = 1

sided = 2

Required sample size = 30 pairs should be taken=20% extra

Formula

$$n_{pairs} = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2}{\Delta^2} + \frac{Z_{1-\alpha/2}^2}{2}$$

$$Where\ \Delta = \frac{\bar{x}_2 - \bar{x}_1}{SD}, \qquad SD = \frac{S_1 + S_2}{2}$$

$Z_{1-\alpha/2}$ =2.58

$Z_{1-\alpha/2}$ =1.682

Since we are taking samples from last 5 years,30 pre and post treatment models will be selected from each year, so the sample size will be 150 in total (150 pre treatment and 150 post treatment cast)

PERMISSIONS OBTAINED

Before the start of the study, ethical approval was obtained from the Institutional Ethics Committee of KLE Academy of Higher Education and Research, KLE University's VK Institute of Dental Sciences, Belagavi

METHODOLOGY

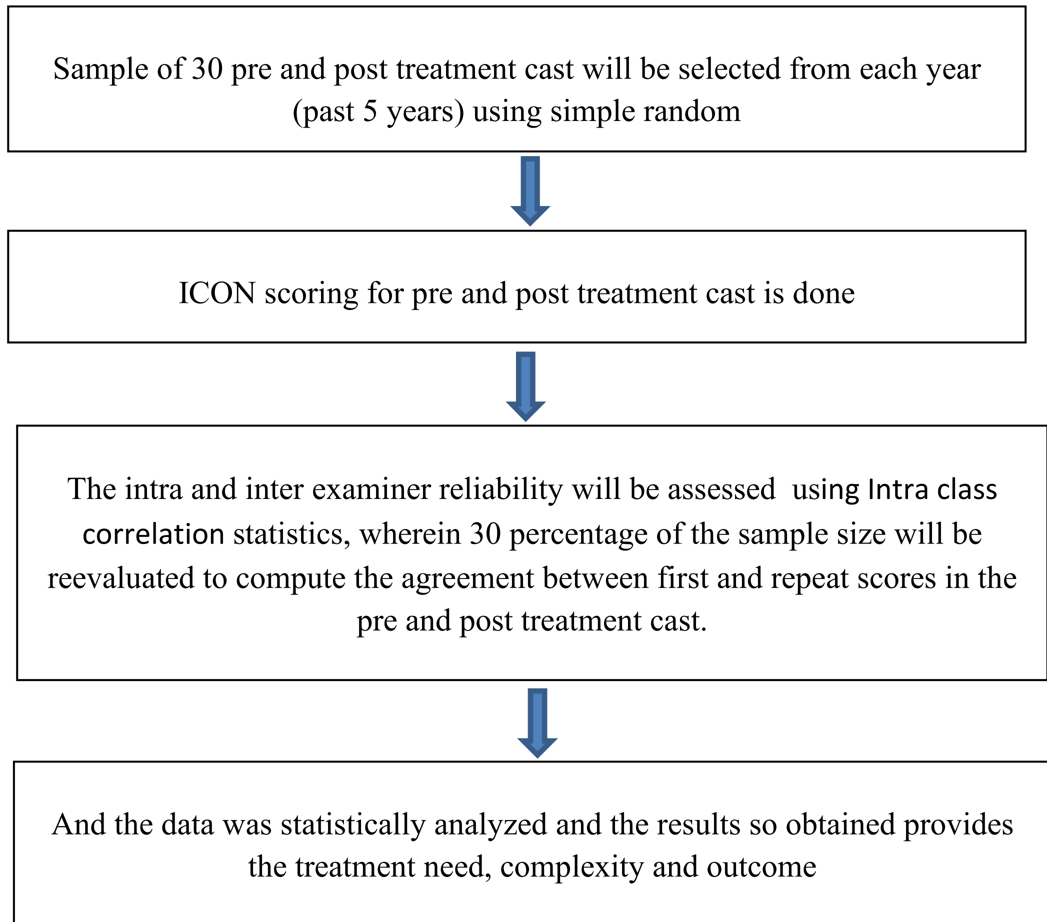
SELECTION OF SUBJECTS

Patients who have undergone orthodontic treatment in the department from the last 5 years.

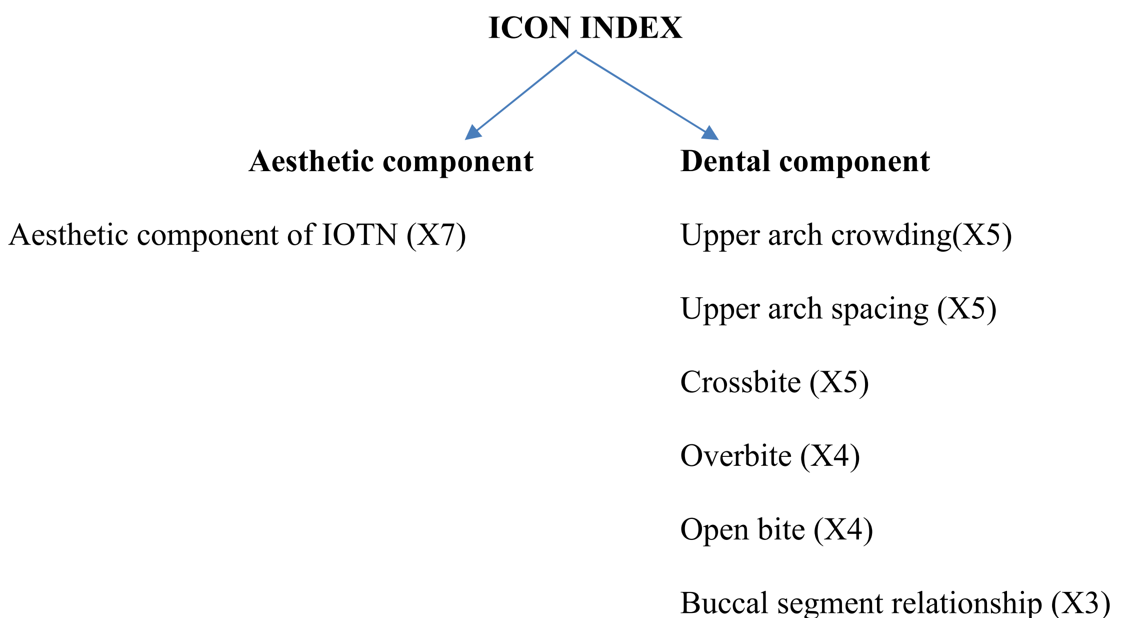
INSTRUMENTS AND MATERIALS

1. Pre treatment cast
2. Post treatment cast
3. Metal ruler
4. Brass wire
5. Divider

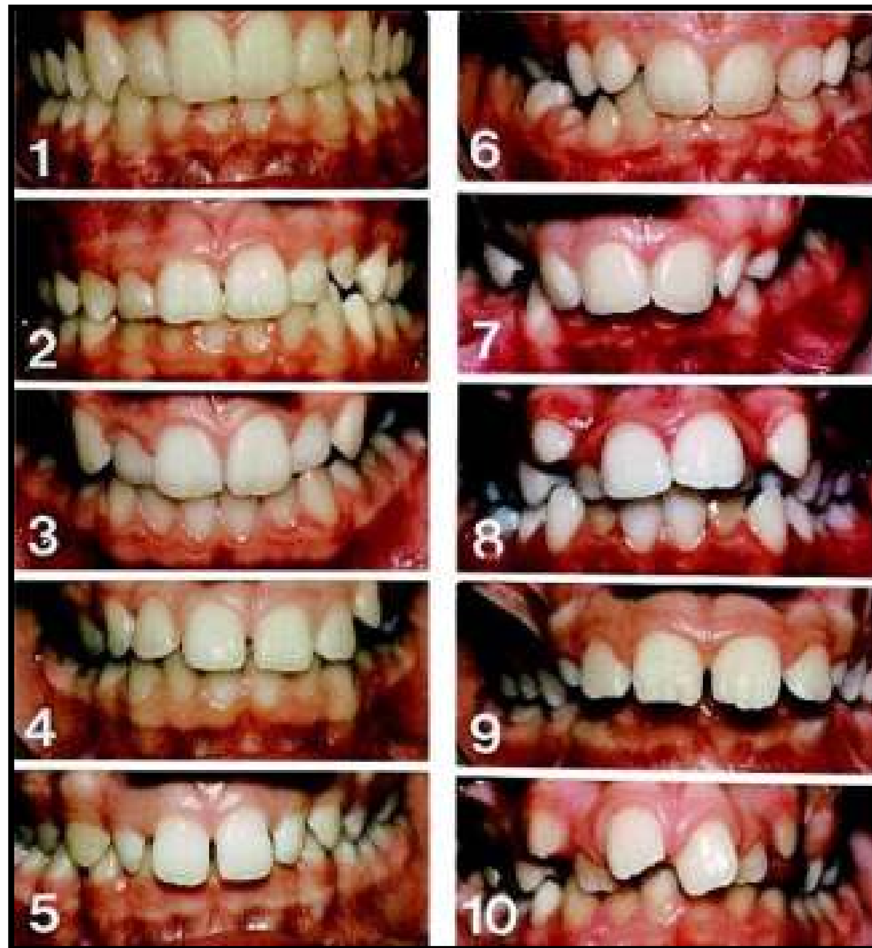
PROCEDURE OF THE STUDY



In this index, the features of both the IOTN and the PAR are incorporated. The scores, mentioned below, are multiplied by its weighting:



AESTHETIC COMPONENT



This aspect of the index is intended to evaluate the aesthetic handicap presented by the malocclusion and thus the psychological impact upon the patient. A set of ten standard photos are reviewed from score 1 to 10. The patient's teeth, in occlusion, are seen from the front view point and the appropriate score is determined by picking the photo that is thought to represent an equal aesthetic handicap . The scores are categorized according to need for treatment and multiplied with 7 (weighting)

Score 1-2	none
Score 3-4	slight
Score 5, 6, or 7	borderline/moderate
Score 8, 9, or 10	definite.

Table 1: Protocol for occlusal trait scoring

	Score	0	1	2	3	4	5
Aesthetic	1–10 As judged using IOTN AC						
Upper arch crowding	Score only the highest trait either spacing or crowding	Less than 2 mm	2·1 to 5 mm	5·1 to 9 mm	9·1 to 13 mm	13·1 to 17 mm	> 17 mm or impacted teeth
Upper spacing		Up to 2 mm	2·1–5 mm	5·1–9 mm	>9 mm		
Crossbite	Transverse relationship of cusp to cusp or worse	No crossbite	Crossbite present				
Incisor open bite	Score only the highest trait either open bite or overbite	Complete bite	Less than 1 mm	1·1–2 mm	2·1–4 mm	>4 mm	
Incisor overbite	Lower incisor coverage	Up to 1/3 tooth	1/3–2/3 coverage	2/3 up to full covered	Fully covered		
Buccal segment anteroposterior	Left and right added together	Cusp to embrasure relationship only, Class I, II or III	Any cusp relation up to but not including cusp to cusp	Cusp to cusp relationship			

<u>**Assessment of need in pre treatment models :**</u>

The study models before treatment are checked and scored.

The total sum of markings for the initial study model gives a pretreatment score, which gives the need and complexity of the treatment required.

Score of more than 43 →indicates need for treatment

Assessment of complexity in pre treatment models :

The pretreatment scores can be graded in different levels of complexity as followed:

Easy	< 29
Mild	29 to 50
Moderate	51 to 63
Difficult	64 to 77
Very difficult	> 77

Assessment of outcome in post treatment models

From the study model taken after the end of the treatment, the index is scored again and if the summary score is less than 31 the outcome is acceptable. The improvement grade can be assessed using the equation below:

Improvement grade =pre treatment score-(4 x post treatment score)

The improvement grades are as followed:

Greatly improved	>-1
Substantially improved	-25 to -1
Moderately improved	-53 to -26
Minimally improved	-85 to -54
Not improved or worse	<-85

RESULTS

Need for the treatment

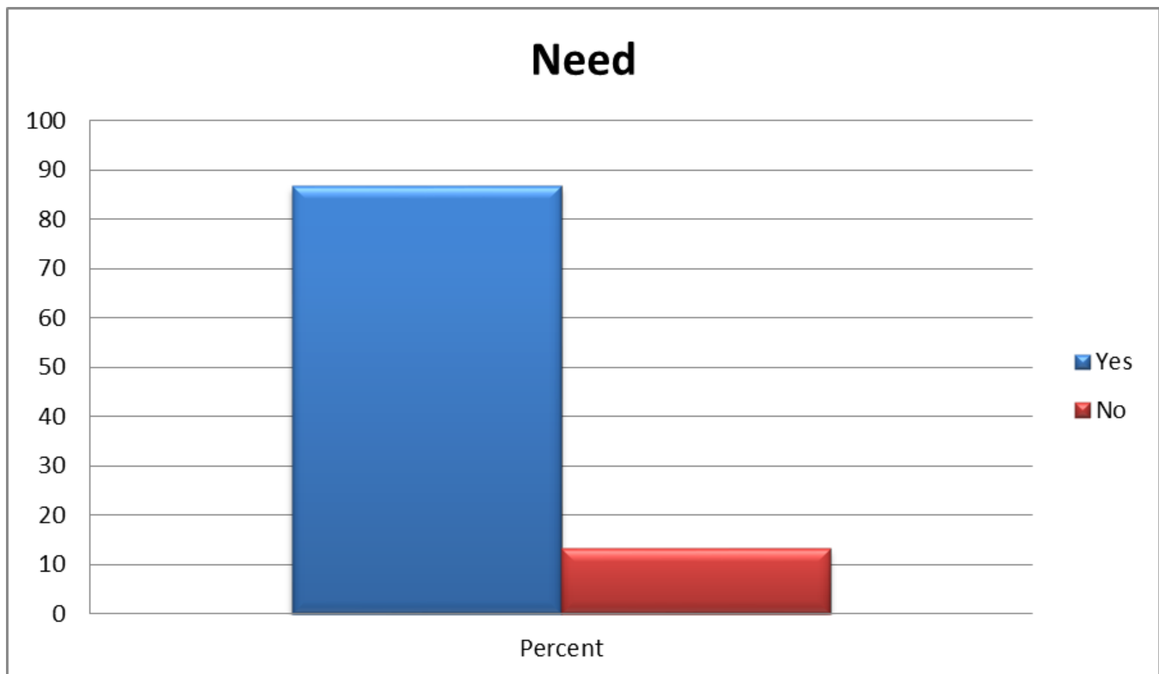


Figure 1: Graph showing the need for orthodontic treatment

Need	Frequency	Percent
Yes	130	86.7
No	20	13.3
Total	150	100.0

Table 2: Table showing the need for orthodontic treatment

This study showed 87% indicates the need for orthodontic treatment and 13% indicates no need of orthodontic treatment. (Graph 1 & Table 2)

Complexity of the case

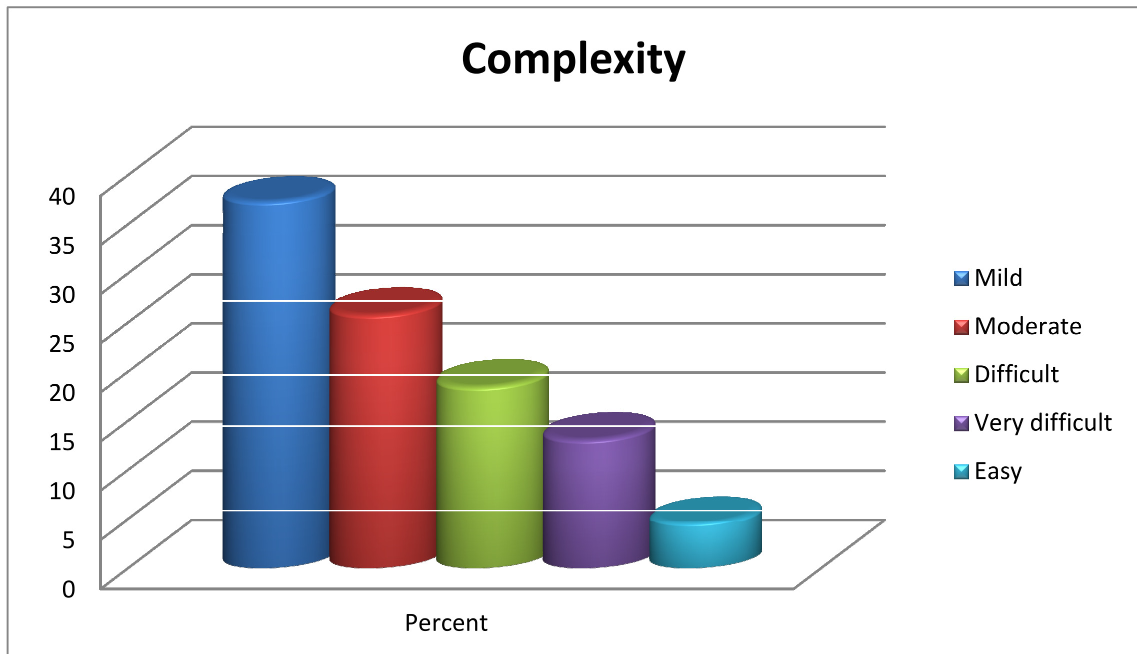


Figure 2: Graph showing the complexity of the case.

Complexity	Mean	SD	Frequency	Percent
Mild	40.86	9.511	56	37.3
Moderate	53.77	10.929	39	26.0
Difficult	57.64	15.896	28	18.7
Very difficult	73.15	26.268	20	13.3
Easy	27.71	.951	7	4.7
Total	51.04	18.384	150	100.0

Table 3: Table showing the complexity of orthodontic treatment

In our study, out of 150 samples 5% were easy, 37% were mild, 26% were moderate, 18% were difficult, 13% were very difficult. (Graph 2 & Table 3)

Outcome of the treatment

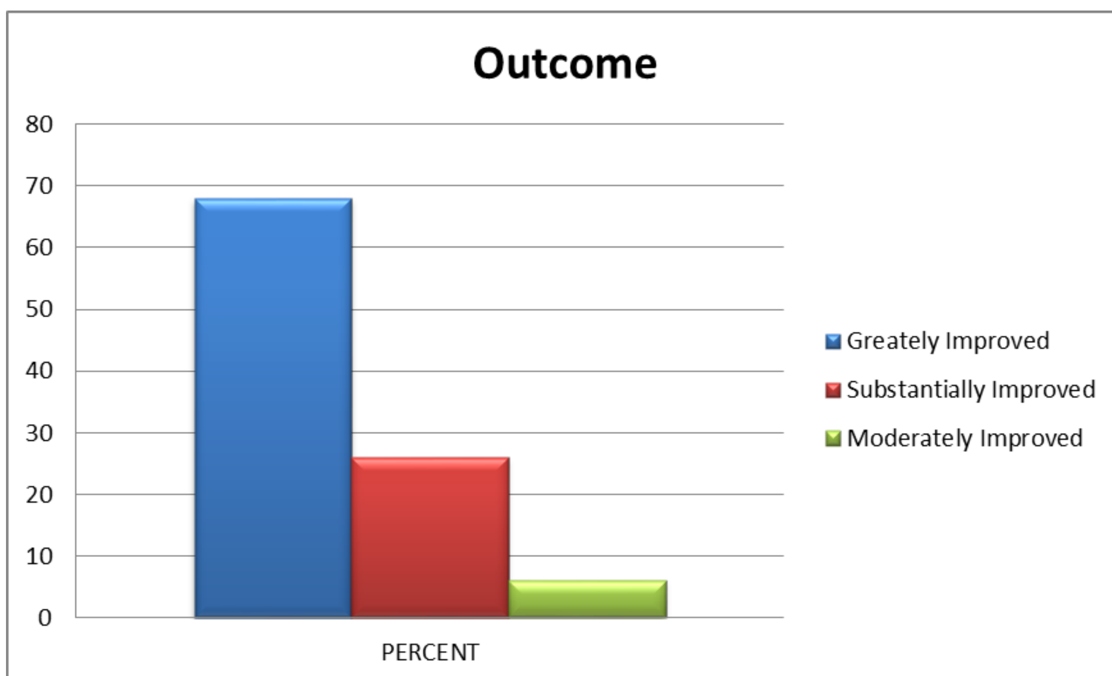


Figure 3: Graph showing the outcome of the orthodontic treatment.

outcome	Mean	SD	Frequency	Percent
GI	15.23	17.374	102	68.0
SI	.28	14.560	39	26.0
MI	-2.00	24.398	9	6.0
Total	10.31	18.511	150	100.0

Table 4: Table showing the outcome of the orthodontic treatment

In our study, 68% of cases showed greatly improved, 26% of the cases showed substantially improved and 6% of the cases showed minimally improved and none of the cases showed no improvement. (Graph 3 & Table 4)

Among 5% of the easy cases 3% were greatly improved and 2% were substantially improved. Out of 37% of mild cases, 19% were greatly improved, 16% were substantially improved and 2% were minimally improved. And 26% of the cases were moderate, out of which 10% of the cases were greatly improved, 13% were substantially improved and 3% were minimally improved. Among 18% of the difficult cases, 13% were greatly improved and 5% were substantially improved. And 13% of the very difficult cases, 8% were greatly improved and 5% were substantially improved

DISCUSSION

Clinical audit is now a common practice in hospitals and clinics, and it is also being expanded to general dental practises. According to Shaw et al. (1989), there are three key reasons to support clinical audit.

- First, the profession is accountable to the public and obtains authorized and financial support for the practice.
- Second, continuous efforts must be made to promote and improve the level of care provided.
- Third, you need to demonstrate your competence to potential patients, the general public, and third-party payment institutions.

The benefits of clinical audits are to improve clinical care, increase effectiveness and efficiency, and increase job satisfaction.[16]

To quantify malocclusion, occlusal features are usually assigned a numerical weighting system and combined into a mathematical expression called the occlusal index.[9]

According to Richmond et al., the early use of the index in orthodontics depends on the principle that if patients need treatment for objective reasons, they should receive orthodontic care, and the result of orthodontic intervention is to eliminate this need. It may be described as too simplistic because the patient may need orthodontic treatment and the degree of malocclusion may be large. Orthodontic treatment can significantly reduce malocclusion, but it does not necessarily reach a state that does not require treatment, so it may not be considered acceptable.[16]

The use of the orthodontic treatment need index (IOTN; Shaw et al., 1991a) and Peer assessment rating (PAR index; Richmond et al., 1992) is now common in the UK for research, auditing and practice management. The most important advantage of using the index is to maximize internal and inter-inspector consistency. Although both IOTN and PAR are reliable and effective, there are some limitations:

1. These two indicators have been developed and validated to evaluate the start and end of the treatment as separate phenomena. This requires additional training and repeated work to measure commonly similar occlusal features.

2. The classification of treatments using dental health components and aesthetic components can be contradictory: one component recommends treatment and the other does not recommend any treatment.

3. When only models are available, the hierarchy of dental health components requires a separate agreement.

4. These indices have been verified for the dental view of the United Kingdom (Richmond et al., 1992, 1995), and therefore may not represent professional opinions in other countries.

5. PAR index was criticized for residual extraction spaces, rotations and unfavourable inclinations of incisors.

Various indices have been created to evaluate the necessity for orthodontic treatment and the outcome.

To have a standardized system, the ideal situation is to have an index that covers these two purposes. This type of index has been proposed in the form of ICON. C. Daniels and S. Richmond have worked hard to build a unified index called ICON

index which utilize same measurement tool to assess treatment need , outcomes and complexity of the orthodontic treatment. The ICON index, given the impressions of 97 orthodontists from 9 countries, and it has been proved as a multipurpose index.. ICON is based on the normal evaluation of a large number of general orthodontic findings.[9]

ICON uses some of the highlights of IOTN and PAR, including five weighted measures (the aesthetic component of IOTN; presence of cross bite, anterior vertical relationship, crowding / upper arch spacing; buccal segment relationship measured by PAR), Decipher the total number of them with the cut-off value to demonstrate the need, complexity, improvement and adequacy of the treatment. ICON was created in eight European countries and the United States, which is obviously more legal than PAR and IOTN. ICON's high degree of legitimacy has been taken into account and some European surveys have shown its reliability to be high.[9]

The IOTN and PAR indices have only been verified in the UK, so considering that they may not fully represent the opinions of international orthodontists. Borzabadi et al concluded that, an index to assess the complexity of the treatment is very important because it allows us to know the type of treatment that the patient should expect and its possible duration.[11]

Self-assessment is defined as the act or process of analyzing and evaluating yourself or your behavior. Basically, the ICON index is found to be helpful because, it is the only index used to assess the treatment need, outcome and complexity of the orthodontic treatment.

The ICON index is a flexible and easy-to-use index. The only equipment required for this purpose is a measuring ruler and pre- and post-processing models. In addition, ICON is a relatively new index and is not used widely.[15]

It has been criticized as it is heavily weighed by aesthetic component. According to a study by Ngom et al., the treatment needs of 665 Senegalese school children between 12 and 13 years old were evaluated. For this purpose, the IOTN and ICON indexes are used. 42.6% of the cases evaluated using the IOTN dental health component required treatment, and 44.1% of the cases evaluated using ICON required treatment. It can be concluded that although aesthetic factors are highly considered, the need for treatment according to ICON is not much different from the results of using IOTN.[17]

Validity refers to the degree to which the measured score represents your expected variable. The effectiveness of ICON as an indication of orthodontic treatment needs was compared to perceived needs as determined by a panel of orthodontic professionals in the United States, according to Firestone et al.[14]

The inspectors calibrated at ICONO evaluated 170 indicators of various types of malocclusion and levels of severity. the research model is used to record orthodontic treatment needs. The results were compared with the decisions of a panel of 15 orthodontists from central Ohio. The expert team found that 64% of castings required orthodontic treatment; the ICON score indicated that 65% of cases required treatment. In 155 out of 170 cases, the expert panel reached an agreement with the index.These findings back up the use of ICON as a reliable predictor of orthodontic treatment need.[14]

According to Ali Borzabadi-Farahani, there was moderate agreement in terms of orthodontic treatment need between the ICON and the AC (IOTN), as well as between the DHC and the AC. The ICON and the IOTN's DHC have a strong working relationship. The ICON is a decent replacement for the IOTN's DHC.The extent to which the scores from a measure represent the variable for which they were designed is known as validity.The validity of the ICON as a measure of orthodontic treatment need was compared to the perception of need as judged by a panel of US orthodontists by Firestone et al. One hundred seventy people participated in the research.[18]

An examiner calibrated in the ICON graded 177 study casts for orthodontic treatment need, encompassing a whole spectrum of malocclusion types and severity. The results were compared to the recommendations of a 15-member expert panel of central Ohio orthodontic specialists. The panel determined that 64% of the castings required orthodontic treatment, with ICON scores indicating that 65% of the cases required treatment. In 155 of the 170 cases, the expert panel and the index were in accord. The ICON's validity as a validated measure of orthodontic treatment need is supported by these findings.[16]

Onyeaso CO and Begole EA in their study examined the relationship among 4 indices that are used to score orthodontic treatment need and outcome, and to determine whether ICON index could replace the other 3 indices, DAI (Dental Aesthetic Index), PAR , ABO-OGS (American Board of Orthodontics Objective Grading System). 100 pre treatment models were randomly selected and concluded that ICON index can be used in place of PAR and ABO-OGS for assessing treatment outcome and in place of DAI for assessing treatment need.[16]

Need for orthodontic treatment

A deviation from ideal occlusion is called a malocclusion, and is common in a large proportion of children and adolescents. Many of these deviations are within the range that is considered normal biological variation. However, some deviations can have a negative impact on the development of the tooth surface, resulting in impaired orafacial function and / or any injuries to the tooth. In addition to local physical consequences, malocclusion can also have a negative impact on the mental health and quality of life of the patient (including self-esteem and self-image).[19]

In our study, out of 150 patients 86.7% of the cases indicates the need for orthodontic treatment based on pretreatment ICON score which was greater than 43. Only 13.3% of cases indicates no need of orthodontic treatment where the pretreatment score was less than 43, which could be due to high level of awareness, social norms, and availability of orthodontic services, despite the high cost of such services. Our results are similar to the study carried out by Onyeaso et al. In this study, out of 100 cases, 86 were considered by the ICON score to require treatment at the beginning of the intervention. Fourteen cases were considered to require no treatment.[16]

Complexity of the treatment

The complexity of orthodontic treatment is defined as the reduction of the successful entity after treatment (Richmond et al., 1997) and the difficulty of treatment because of the effort required to establish a correct (normal) dental relationship (Bergström and Halling, 1997.[15] The complexity of orthodontic treatment is regulated by the interaction of factors related to patient compliance, doctor's skills and experience, and the characteristics and severity of malocclusion. Rowe et al.

(1990) studied the evaluation of the difficulty of treatment by 30 orthodontists who checked the pre-treatment records and concluded that the severity of malocclusion and the difficulty of treatment are different but related entities.[20]

De Guzman et al. (1995) also found a close relationship between the perceived severity of malocclusion and the difficulty of treatment. However, it has also been suggested that measures of difficulty and severity measure the same underlying characteristics, or that the difference between the two is small. The proposed IOTC has enough hope to ensure further development. Difficulty and complexity of orthodontics are synonymous and should be defined as a measure of effort and skill, while severity is a measure of the deviation of malocclusion from normal.[21]

As discussed earlier, complexity is divided into easy, mild, moderate, difficult and very difficult based on the pretreatment scores of ICON index. In our study, out of 150 samples 5% were easy, 37% were mild, 26% were moderate, 18% were difficult, 13% were very difficult.

Outcome of the treatment.

Outcome of the treatment is nothing but the result that we achieve at the end of the orthodontic treatment. Our goal in orthodontics, is to treat all cases with the best possible results. With the advancement of technology, people expect the treatment effect to be improved. There are several factors that affect the outcome of treatment, including patient compliance, treatment quality, and treatment duration. Treatment outcomes are classified as very improved, significantly improved, moderately improved, slightly improved, and no improvement based on the post-treatment score calculated using the ICON index.[9]

In our study, 68% of cases showed greatly improved, 26% of the cases showed substantially improved and 6% of the cases showed minimally improved and none of the cases showed no improvement. This is contrary to the study done by S.Richmond et al in which 6%of the cases showed no improvement.

Among 5% of the easy cases 3% were greatly improved and 2% were substantially improved. Out of 37% of mild cases, 19% were greatly improved, 16% were substantially improved and 2% were minimally improved. And 26% of the cases were moderate, out of which 10% of the cases were greatly improved, 13% were substantially improved and 3% were minimally improved. Among 18% of the difficult cases, 13% were greatly improved and 5% were substantially improved. And 13% of the very difficult cases, 8% were greatly improved and 5% were substantially improved.

The above mentioned information gives a bird's eye view of the treatment done by the PG's done in the department. . This information can be used to evaluate patient satisfaction, and also for self-assessment for the Orthodontist. At the same time, it also provides data for scope of improvement, to identify the problems associated with less than satisfactory improvement, and to look for smarter ways to curb for these problems.

Advantages of ICON index

1. Easy to use, only needs a millimeter ruler and an aesthetic component scale
2. The index is designed for late mixed dentition and permanent dentition.
3. No hierarchy required

4. Relatively few features are measured

5. Furthermore, the index can be applied clinically to patients and casts without any modification.

6. This index is suitable for evaluating treatment needs, complexity and results, avoiding the use of different indices for different forms of evaluation.

7. ICON is unique in that it uses aesthetic scores as an integral part of the assessment of treatment needs. Because it is not only an indicator of treatment needs, but also an occlusal indicator of the severity of the malocclusion.

LIMITATIONS OF THE STUDY

1. The index has a high aesthetic weight (weight seven), which is an assessment based on subjective opinions, thus reducing the objectivity of the index.
2. The accuracy of ICON's prediction of treatment outcome is relatively lower than that of treatment needs, because the consistency of the examiner's decision on the acceptability of treatment is low
3. Only upper arch is evaluated
4. Soft tissue components are not taken into consideration
5. Overjet is not considered.

SCOPE OF THE STUDY

1. Qulaity of orthodontic treatment can be assessed between different colleges using ICON index.
2. A questionnaire can be conducted along with ICON index inorder to assess patient's satisfaction.

CONCLUSION

ICON index can be used as an self assessment tool which would help to increase the quality of the orthodontic treatment. The approach to establish a successful orthodontic treatment could be drastically different for the patient and for the orthodontist. A technically good treatment from an orthodontist's perception, might not be satisfactory to the patient, and vice versa. It is imperative for an Orthodontist to take time to understand patient needs, identify their expectations and provide a unique tailored treatment plan for each patient to achieve the right balance between patient satisfaction and technically sound treatment, which should be considered a successful orthodontic treatment.

SUMMARY

The evaluation of malocclusion is very essential as they play a very important role in diagnosis and also to identify the treatment need of the patient. One of the serious issues in examining malocclusion is the accessibility of an appropriate technique for recording the event and seriousness of orthodontic issue. Several indices have been developed to evaluate the prevalence and severity of malocclusion like Dental Aesthetic index (DAI), Peer Assessment Rating (PAR), Index of Orthodontic treatment Need (IOTN).

Studies have shown that there is no single index that has been created and validated to assess treatment need, complexity and outcome. An exertion has been made by C. Daniels and S. Richmond, to frame a unified index ICON, so as to utilize the same measurement tool to assess the treatment need, treatment outcome and complexity.

Thus, this study helps us to assess the quality of treatment of orthodontic cases treated in the department based on the ideal scores as prescribed by ICON index. Based on the results, scope for enhancing the quality of treatment in long run will be considered.

Cross sectional study was conducted on patients who have undergone orthodontic treatment in the department for the past 5 years. This study showed 87% indicates the need for orthodontic treatment and 13% indicates no need of orthodontic treatment. In our study, out of 150 samples 5% were easy, 37% were mild, 26% were moderate, 18% were difficult, 13% were very difficult.

Among 5% of the easy cases 3% were greatly improved and 2% were substantially improved. Out of 37% of mild cases, 19% were greatly improved, 16% were substantially improved and 2% were minimally improved. And 26% of the cases were moderate, out of which 10% of the cases were greatly improved, 13% were substantially improved and 3% were minimally improved. Among 18% of the difficult cases, 13% were greatly improved and 5% were substantially improved. And 13% of the very difficult cases, 8% were greatly improved and 5% were substantially improved

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ANNEXURE - I - ETHICAL CLEARANCE LETTER

Research and Ethics Committee
KLE V K INSTITUTE OF DENTAL SCIENCES
KLE University

Accredited 'A' Grade by NAAC Placed in Category 'A' by MHRD (GoI)

Nehru Nagar, Belagavi - 590 010, Karnataka State

☎: 0831-2470362 Web: http://www.kledental-bgm.edu.in
FAX: 0831-2470640 E-mail:principal@kledental-bgm.edu.in

Sl. No. : 1318

CERTIFICATE

This is to Certify that the synopsis titled A QUALITY ASSESSMENT OF ORTHODONTIC TREATMENT USING ICON INDEX (INDEX OF COMPLEXITY, OUTCOME, OUTCOME & NEED) - RETROSPECTIVE STUDY. *Submitted by Dr.* PREETHI. S. *P. G. Student / Staff, Guided by* DR. ROOPA. JATTI *from Department of* ORTHODONTICS & DENTOFACIAL ORTHOPAEDICS *has been critically evaluated by committee members and granted ethical clearance to conduct the above mentioned study*

Date :

Member Secretary
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi

Chairman
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi