

Orthodontic treatment needs in Caribbean dental clinics

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SUMMARY This study was undertaken to determine the normative and perceived orthodontic treatment need of patients in Trinidad, a Caribbean island. The study sample comprised 30 child dental health clinic patients, 30 of their accompanying parents, and 52 adult patients from other University of the West Indies clinics and the Dental Hospital in Mount Hope, Trinidad. Two clinicians used the Dental Health Component of the Index of Orthodontic Treatment Need (IOTN) to assess normative need, and the patient's perceived needs were assessed using the Aesthetic Component (AC) of the IOTN and the Oral Aesthetic Subjective Impact Scale (OASIS). Fisher's exact test was used to determine the differences between the subgroups of the sample for both normative and perceptive treatment need. Association between normative need and perception assessment measures was tested using Spearman's correlation coefficient.

Two-thirds of the sample of 112 subjects were female and each subgroup had a similar gender distribution. The results also indicate that approximately four out of five Trinidadians have a great (or very great) orthodontic treatment need. The perception of orthodontic treatment need differed significantly ($P < 0.05$) from normative need in this sample and this was seen more clearly when the OASIS was used.

Introduction

Since the 1960s, several indices have been developed that assess the severity of malocclusion and the need for orthodontic treatment. These evaluations were carried out strictly from a professional viewpoint (normative need) but several studies have shown that self-perceived dental appearance is an important determinant in the decision to seek orthodontic treatment (Gosney, 1986; Espeland and Stenvik, 1991; Espeland *et al.*, 1992; Pietilä and Pietilä, 1996). The functional and psychological benefits of treatment are uncertain; this makes the determination of orthodontic treatment need difficult (Shaw *et al.*, 1980). Additionally, evaluation of aesthetic factors is subjective and consequently not easily determined (Gosney, 1986).

The Index of Orthodontic Treatment Need (IOTN) is useful for defining the severity or degree of occlusal traits. It incorporates both a Dental Health Component (DHC; Brook and Shaw, 1989) and an Aesthetic Component (AC; Evans and Shaw, 1987). Several researchers (Richmond *et al.*, 1995; Jones *et al.*, 1996; Younis *et al.*, 1997) have established the validity and reliability of the IOTN. The IOTN has been used as an epidemiological tool to assess treatment need among school children (Shaw *et al.*, 1991; Holmes, 1992; Otuyemi *et al.*, 1997). However, the IOTN is not a measure of treatment demand; this is particularly relevant since treatment is primarily influenced by demand and not always by need (Mandall *et al.*, 2001).

The Oral Aesthetic Subjective Impact Scale (OASIS) is an independent self-evaluation tool, which considers the self-perception of the evaluated person regarding their

orthodontic treatment need. It is a consumer-based measure based on a child's perceived socio-psychological impact of their malocclusion (Mandall *et al.*, 2000). It measures the childhood impact of external influences by asking questions concerning their perceptions of others and themselves, as well as about their previous behaviour related to the appearance of their teeth. The validity of OASIS is supported by its correlation with the normative IOTN AC, which may be considered as the gold standard (Mandall *et al.*, 2001).

Several investigations have been conducted that determined the orthodontic treatment needs of patients. However, there is no publication (in English) of a well-conducted study on a Caribbean population. In this research, both the normative and the perceived orthodontic treatment needs of dental patients in Trinidad were assessed and analysed using the IOTN and OASIS assessment tools. The aim was to determine these normative and perceived needs as referrals will be based on professional opinions but it is the patient's perception of orthodontic treatment need with respect to both aesthetics and function that is the main factor that encourages them to seek treatment (Yeh *et al.*, 2000). This study also set out to test the validity of the OASIS self-evaluation tool in expressing the orthodontic treatment need of some Caribbean dental patients.

Subjects and methods

Ethical approval for this study was obtained from the University of the West Indies Faculty of Medical Sciences Ethics Committee.

Sample selection

The sample consisted of three groups comprising 30 child dental health clinic patients, 30 of their accompanying parents, and 52 adult patients from the Restorative Dental Polyclinic and Emergency Clinics. The subjects were selected consecutively from these clinics over a period of 3 months at the University of the West Indies School of Dentistry and the Dental Hospital in Mount Hope, Trinidad. The residences of the subjects in this study covered a full and normal range of the entire geographic area of Trinidad: 9 in the south, 10 in the west, 23 in the north, 27 central, and 43 in the east. All the children were between 12 and 17 years of age. No patient and/or parent refused to participate in the study when asked but some patients were excluded because they had previously undergone orthodontic treatment or had sustained recent trauma leading to pain on presentation to the emergency clinic.

Interviews and clinical examinations

Informed consent was obtained from all eligible subjects. They were then asked to complete a questionnaire (Figure 1). Their age, gender, race, and geographic area of residence were also recorded.

Interviews and clinical examinations were carried out by two clinicians (COB and RB). The questionnaire was first administered separately to the parents and the children to avoid bias, and to the adult patients alone. The subjects were then presented with 10 coloured photographs of anterior teeth displaying varying degrees of malocclusion (Evans and Shaw, 1987) and were asked to evaluate which photograph on this aesthetic scale most closely resembled their own dentition. They were initially given a mirror so that they refreshed their memory but were not allowed to continue self-examination while viewing the photographs. The subjects were examined to determine their IOTN (DHC) following which they continued their routine treatment at the clinic. All IOTN AC scores of patients

under 18 years of age were carried out separately from their parents to avoid possible bias.

Data analysis

The EViews 6 statistical package (Quantitative Micro Software, Irvine, California, USA) was used to analyse the data. For each of the three assessment tools, DHC, AC, and OASIS, the patients were categorized as having little/no need, borderline, or great need, and the frequency distribution was determined for each subgroup. Fisher's exact test was used to determine differences in the frequency distribution among the subgroups. Fisher's exact test is similar to the chi-square test of association between the row and column variables of a contingency table. As Fisher's test does not depend on large sample distribution assumptions, it is appropriate even for small sample sizes.

Spearman's rank order correlation coefficient was used to test for associations between normative need and perception assessment measures. The specific interest was to determine the validity of the use of the OASIS by assessing its correlation with the IOTN components. The correlation was assessed for each of the three patient groups as well as for the whole sample. All three measures, OASIS, DHC, and AC, are rankings but with different ranges. Hence, the Spearman's rank order correlation coefficient is the appropriate statistical test of the null hypothesis of no correlation. A 5 per cent significance level was set for all tests.

Results

Data description

Females comprised two-thirds of the sample of 112 participants, with a similar distribution for each group. A value of $P = 0.7099$ for Fisher's exact test confirmed that there were no differences in gender distribution for the three groups (Table 1). The results of simple descriptive statistical analysis for each group are shown in Table 2.

1. How do you feel about the appearance of your teeth?						
1	2	3	4	5	6	7
Not concerned at all		somewhat concerned			Very concerned	
2. Have you found that other people have commented on the appearance of your teeth?						
1	2	3	4	5	6	7
Not at all		sometimes			All the time	
3. Have you found that other people have teased you about the appearance of your teeth?						
1	2	3	4	5	6	7
Not at all		sometimes			All the time	
4. Do you try to avoid smiling because of the appearance of your teeth?						
1	2	3	4	5	6	7
Not at all		sometimes			All the time	
5. Do you ever cover your mouth because of the appearance of your teeth?						
1	2	3	4	5	6	7
Not at all		sometimes			All the time	

Figure 1 Oral Aesthetic Subjective Impact Scale questionnaire.

Table 1 Gender distribution (%) by group.

Group	Gender		Total
	Female	Male	
Adult	33 (63)	19 (37)	52 (46.4)
Child	20 (67)	10 (33)	30 (26.8)
Parent	22 (73)	8 (27)	30 (26.8)
Total	75 (67.0)	37 (33.0)	112 (100)

P-value = 0.7099.

Treatment need

Table 3 shows that using the IOTN DHC, 77.7 per cent of the sample had a great orthodontic treatment need, 14.3 per cent were borderline while only 8 per cent were assessed as having little or no need. There were no differences between the groups for treatment need as assessed using the DHC (Fisher's exact test $P = 0.9465$). The identical grade distribution for the parent and child groups confirmed this.

The perceived treatment need assessed using the IOTN AC showed a reverse of the DHC assessment; 86.6 per cent of the sample had a slight or no need, 8 per cent were borderline, and only 5.4 per cent had a great need (Table 4). This disparity was most obvious in the adult patient group where over 92 per cent showed little or no need, while less than 2 per cent had a great need. There was no statistical difference between the groups for aesthetic treatment need.

Using the OASIS, the majority (64.3 per cent) of the sample was borderline in their perceived treatment need, 3.6 per cent indicated a great need, while the remaining 32.1 per cent self-assessed as having little or no need for treatment (Table 5). The percentages were somewhat similar for the three groups, although for the child group, a relatively higher percentage indicated little or no need, reducing the dominance of the borderline cases. The P -value of 0.8351 for the exact test, however, suggests no statistical evidence of differences between the three groups in their OASIS assessment of treatment need.

Correlations of assessment measures

Table 6 reports the Spearman's rank order correlation coefficients and their significances for each pair of assessment measures, both within groups and for the whole sample. Correlations between the assessment tools confirmed that there was no association between the two components of the IOTN, either for the sample or within the groups ($P > 0.05$). There was, however, evidence of a relationship between the IOTN components and the OASIS for the sample as a whole ($P < 0.05$). This relationship was strongly driven by the parent group where the coefficients were relatively large and statistically significant as opposed to those for the other groups.

Discussion

Epidemiological aspects

Most publications on normative and perceived orthodontic treatment need of populations sample children in schools (Otuyemi *et al.*, 1997; Liepa *et al.*, 2003; Marques *et al.*, 2007; Danaei *et al.*, 2007). That sampling method advantageously covers an adequate geographical range of a population but limits the view to a narrow age range. Contrastingly, the sample method used in the present study produced a bias that limits its ability to represent the segment of the population in Trinidad that seeks dental treatment but, due to the geographic location of the dental school and hospital, the residences of the subjects covered a full and normal range of the entire geographic area of Trinidad and thus empowered the sample to be adequately representative of the population seeking dental treatment in Trinidad. As this segment of the population is of great interest, the results and conclusions generated by this study are thus quite valuable. The protocol was also designed to sample both child and adult patients as orthodontic subjects pools tend to contain at least 25 per cent of adults (Gottlieb *et al.*, 1991). The inclusion of parents' opinions in the sample does not appear to be disadvantageous as the genetic link in the aetiology of the malocclusions sampled is irrelevant in the consideration of the perceived orthodontic treatment need in this study; inclusion of the parents' opinions is

Table 2 Descriptive statistics of the Dental Health Component (DHC) and Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN) and Oral Aesthetic Subjective Impact Scale (OASIS) by group.

Score	Adult ($n = 52$)			Child ($n = 30$)			Parent ($n = 30$)		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
IOTN DHC	1	5	4	1	5	4	1	5	4
IOTN AC	1	8	2	1	8	2	1	8	2
OASIS	5	35	11	5	29	11	5	27	12

Table 3 Distribution (%) of the Dental Health Component (DHC) of the Index of Orthodontic Treatment Need grade by group.

DHC (grade)	Group			Total
	Adult patient	Child	Parent	
No/little (1–2)	5 (9.6)	2 (6.7)	2 (6.7)	9 (8.0)
Borderline (3)	6 (11.5)	5 (16.7)	5 (16.7)	16 (14.3)
Great need (4–5)	41 (78.9)	23 (76.7)	23 (76.7)	87 (77.7)

P-value = 0.9465.

Table 4 Distribution (%) of the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need by group.

AC (grade)	Group			Total
	Adult patient	Child	Parent	
No/little (1–4)	48 (92.3)	24 (80.0)	25 (83.3)	97 (86.6)
Borderline (5–7)	3 (5.8)	3 (10.0)	3 (10.0)	9 (8.0)
Great need (8–10)	1 (1.9)	3 (10.0)	2 (6.7)	6 (5.4)

P-value = 0.4231.

Table 5 Distribution (%) of the Oral Aesthetic Subjective Impact Scale (OASIS) by group.

OASIS (grade)	Group			Total
	Adult patient	Child	Parent	
No/little (1–10)	14 (26.9)	12 (40.0)	10 (33.3)	36 (32.1)
Borderline (11–25)	36 (69.2)	17 (56.7)	19 (63.3)	72 (64.3)
Great need (26–35)	2 (3.9)	1 (3.3)	1 (3.3)	4 (3.6)

P-value = 0.8351.

advantageous by making the sample (of opinions) more representative of the segment of the population seeking dental treatment.

In 2006, the government of Trinidad and Tobago's census reported that the country's population had a male to female ratio of approximately 1:1 and an ethnic origin that is African (38%), East Indian (40%), mixed (20%), and from other (Caucasian, Chinese, and other) groups (2%; Central Statistical Office, 2006). In this study, the racial distribution of the sample probably varied from that reported by the national census due to subjects being more inclined to describe themselves as 'mixed' giving full details of their mixture of races to aid in scientific discovery. There were twice as many females in this study than males, which is consistent with typical dental survey findings when the sample is obtained from a patient pool in a dental clinic (Gray *et al.*, 1970; Todd and Dodd, 1985; Hamdan, 2004).

Comparison with other studies

The results of the present study indicate that almost 78 per cent of patients had a definite/normative need for orthodontic treatment need. This appears to be quite high in comparison with other countries in the Americas, Europe, Asia, and Africa (Otuyemi *et al.*, 1997; Esa *et al.*, 2001; Liepa *et al.*, 2003; Danaei *et al.*, 2007; Marques *et al.*, 2007). Most patients of the Dental Hospital and School of Dentistry are seen by appointment but a significant percentage attend for emergency treatment without an appointment being made in advance. Consequently, this Caribbean sample may be different to samples from other countries where subjects are obtained from schools. Thus, those samples may not be useful for comparison with the current findings.

Hamdan (2004) studied a sample of attendees of a new patient orthodontic clinic at Jordan University Hospital, which is similar in composition for comparison with this study's results. In that sample, the normative need for orthodontic treatment was great (or very great) for 71 per cent, moderate 22 per cent, and little or none 7 per cent. This percentage distribution is very similar to the findings in this Caribbean sample. The difference in perceived need between groups using the IOTN AC was not as contrasting in the Jordanian study but is similar, with the clinician being more critical of the malocclusion than parents and patients and this

Table 6 Spearman's correlation coefficients (and *P*-values). AC, Aesthetic Component; DHC, Dental Health Component; OASIS, Oral Aesthetic Subjective Impact Scale.

	Adult (<i>n</i> = 52)		Child (<i>n</i> = 30)		Parent (<i>n</i> = 30)		All (<i>n</i> = 112)	
	DHC	AC	DHC	AC	DHC	AC	DHC	AC
AC	0.142 (0.314)		−0.033 (0.860)		0.241 (0.199)		0.079 (0.406)	
OASIS	0.186 (0.185)	0.119 (0.402)	0.137 (0.470)	0.162 (0.394)	0.456 (0.011)	0.351 (0.057)	0.249 (0.008)	0.201 (0.034)

difference was shown to be significant. Hamdan (2004) also found significant differences between clinician-measured DHC and patients' and parents' perceived need scores.

The use of orthodontic treatment need indices

The results of simple descriptive statistical analysis for each group (Table 2) show an obvious similarity in the groups' distribution of scores for each evaluation measure. The parent group's OASIS distribution of scores, when compared with the other groups, is narrower in range and its median score is more to the right. Most importantly, though, the results of this study show that the DHC and AC of the IOTN can provide perspectives of the same malocclusion that differ to the extent that they are the opposite in (clinical) significance for laypeople.

Contrary to expectations, a greater percentage of patients' and other lay people's perceived orthodontic treatment need was in the little (or no) or moderate ranges. Using OASIS, the majority of the sample considered that their orthodontic treatment need was moderate but using the AC of the IOTN, the majority of the same sample believed that their orthodontic treatment need was low. These results suggest that, in Trinidad, the layperson's perception of orthodontic treatment need depends greatly on their view of their smile, i.e. facial and not occlusal, their knowledge of malocclusion and/or orthodontic treatment, and the questions that clinicians are likely to ask them on presentation for an examination. Despite some significant differences in the results, according to the index used by the layperson, the collective view is cumulatively and clearly the opposite of or greatly different from the trained clinician's view.

The correlation of the OASIS with both components of the IOTN may be due to its wider score range (resulting in more borderline assessment) and is supportive of its validity as a tool for orthodontic treatment need assessment. As patients and parents do not see malpositioned teeth from the occlusal and buccal views and they have no training on the use of the AC of the IOTN, it is understandable that they do not appear to see malocclusion and its severity as easily or readily as trained clinicians. Previous studies have shown that laypeople tend to have a less critical view of the same malocclusions assessed by professionals (Shaw *et al.*, 1975; Pahl-Andersen, 1978; Stenvik *et al.*, 1997). As a result, no correlation was found in the present study between the IOTN DHC and the IOTN AC. If IOTN AC training with calibration of the two examiners had been undertaken, objective assessment of the need for orthodontic treatment of dental patients in Trinidad could also have been carried out with the AC of the IOTN; this would have generated a large and significant body of data to add to the results and conclusions of this study. Although the IOTN DHC can be used to indicate the likely level of demand for orthodontic treatment, OASIS appears to be the more appropriate tool to determine patient's perceived need and

is therefore a better indicator of the level of demand for orthodontic treatment.

Conclusions

Almost 78 per cent of patients attending Trinidadian dental clinics had a great (or very great) definite/normative need for orthodontic treatment. However, the findings also suggest that laypeople's perception of orthodontic treatment need depends greatly on visual observation of the AC of their occlusion. The layperson's view is cumulatively and, at times, clearly the opposite of the trained clinician's view. No correlation was found between the IOTN DHC and the IOTN AC. Therefore, a better indicator of the level of demand for orthodontic treatment and the patient's perceived need appears to be OASIS.

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