

# NORMATIVE AND PERCEIVED ORTHODONTIC NEEDS AMONG 12 YEAR OLD SCHOOL CHILDREN IN CHENNAI, INDIA - A COMPARATIVE STUDY

Four schools were selected randomly and all 12 year old children were included in the study. A total of 613 school children (334 boys and 279 girls) were examined. A self-administered pre-tested questionnaire about perceived need to have their teeth straightened was elicited. Clinical examination was carried using Dental Aesthetic Index (DAI). Chi-square test was done to test the association between normative orthodontic need and perceived orthodontic need. Minor or no anomaly was seen in 350 (57.1%) subjects of which 162 (46.3%) perceived orthodontic treatment, definite malocclusion was seen in 158 (25.8%) subjects of which 75 (47.5%) perceived orthodontic treatment, severe malocclusion was seen in 69(11.3) subjects of which 33 (47.8) perceived orthodontic treatment, handicapping malocclusion was seen in 36(5.9%) subjects of which 27(75%) perceived orthodontic treatment. The normative orthodontic needs and perceived orthodontic needs were statistically significant. The assessment of perceived need should be included in the epidemiological studies to the estimate demand for orthodontic treatment in particular regions.

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## Introduction

Malocclusion may be understood as the mal-relationship of dental unit with respect to one another, both inter-arch and intra-arch and to the other components of the craino-facial complex. It can also be said to be a deviation existing in an individual from the standard concept of occlusion (Proffit et al., 1999). Malocclusion influences many aspects of life, such as social interaction; opportunities or the lack of them when seeking employment; the choice of partners; and in personality characteristics. Malocclusion causes difficulty in chewing food, has the tendency to cause cheek bite, speech defects, and pain in the facial muscles or jaw (Nicodemo et al., 2008).

Malocclusion is not a disease per se but rather a departure from an aesthetic norm in a society. The main expected benefits of orthodontic treatment relate to improvements of oral function and appearance that will lead to improved psychological and social well-being.

The concept of need is essential for planning and evaluation of oral health care. Most needs assessments are based on normative or professionally defined need. The clinical indicators in current use do not take account of the individual's perception of need. Brandshaw's taxonomy of need defines normative need as that which the professional or expert defines as need in a given situation. Felt or perceived need is a lay person's own assessment of his or her needs.

Subjective perceptions play a key role in orthodontics, especially as the demarcation between an acceptable and unacceptable occlusion is influenced by idiosyncratic judgments and therefore may differ considerably according to the aesthetic standards of

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the person and the respective societal norms.

There are considerable differences between a clinician's and patient perceptions of dental appearance and needs for orthodontic treatment. Various studies on children and adolescents have shown that they had a more positive view about their present oral health status with regards to malocclusion, than oral health professionals. The inconsistencies between the normative and subjective perceptions of malocclusion were also confirmed when assessing agreement between clinical and oral health related quality of life measures. A high percent of Brazilian adolescents who were normatively considered to need orthodontic treatment did not report impacts on their quality of life. This clearly shows that clinical and perceived assessments of need represent different standpoints that should be considered (Tsakos, 2008).

In recent years, much attention has been focused on measuring the severity and prevalence of malocclusion and orthodontic treatment needs worldwide. Orthodontic treatment needs and demand are assessed for dental public health programs, clinical treatment, treatment priority determination, resource planning and third party funding (Nobile Carmelo et al., 2000).

The WHO has recommended Dental Aesthetic Index (DAI) as a method of assessing the dento-facial anomalies. DAI is a cross-cultural index focused on socially defined dental aesthetics (Shivakumar et al., 2009). The DAI is an orthodontic index that links clinical and aesthetic components mathematically to produce a single score that combines physical and aesthetic aspects of occlusion, including patient perception (Hamamci et al., 2009). It also aims to predict the clinical judgments of orthodontists by separating handicapping and non-handicapping malocclusions.

DAI is recommended for those age groups in which primary teeth are no longer present, usually from 12 years (World Health Organization, 1997). All self-correcting malocclusions would have been self-rectified by the age of 12 years. A study conducted in Chennai (2005) among 12 year old children, revealed mild to moderate malocclusion (Mahesh Kumar et al., 2005). Even a perfunctory review of literature revealed that the assessment of perceived orthodontic needs, self-aesthetic perception, and social function in Chennai remains a glaringly under explored avenue.

Hence, the aim of the study is to assess the perceived and normative orthodontic needs among 12-year old school children in Chennai, India.

## **Materials and methods**

A cross sectional study was conducted in Chennai the capital of Tamil Nadu which is the 4th largest metropolitan city in India. The urban agglomerate of Chennai has an estimated population over 8.05 million (2009) making it one of the largest urban agglomerate in India (Chennai demography). The study was carried out on 12 year old school children. The study population consisted of 36 579 (Male=17935; Female=18644)15 school children.

All children who had completed 12 years of age and who were present on the day of examination formed the study population. Students who had received/undergoing orthodontic treatment, medically compromised children, handicapped children, subjects not willing to participate in the study were excluded. Ethical clearance was obtained from institutional review board, Saveetha University. An approval from the concerned school authorities and informed consent from the parents or guardian of school children were obtained prior to the study.

The prevalence of malocclusion was estimated to be 40% (Esa et al., 2001) and the sample size was calculated using scientific method. The estimated sample size was 576 subjects. A cluster randomized technique was used. Four schools were randomly selected from the list of schools in Chennai 15 and all the 12 year old children from the selected schools

were included in the study. Data collection was scheduled for a period of 40 days. About 20-25 children were examined each day.

A self-administered pre-tested questionnaire designed to elicit information on demographic information including name, age, school, gender was employed. The subjects were questioned about; perceived need to have their teeth straightened, social function and their self-satisfaction with their appearance when compared to others.

All the study subjects were examined by a single examiner with the use of mouth mirror and CPI probe. The intra-examiner reliability was calculated using the data obtained by reexamination of first and eleventh subject of each day after scheduled number of subjects was examined for the day ( $k=0.71$ ).

The clinical examination criteria employed was the Dental Aesthetics Index (DAI) with the following ten components:

1. Number of missing visible teeth(incisors, canines and Premolars in the maxillary and mandibular arches);
2. Crowding in the incisal segments: 0=No segment crowded 1=1 segment crowded, 2=2 segment crowded;
3. Spacing in incisal segments: 0= no spaced; 1=1 segment spaced, 2=2 segment space;
4. Midline diastema in mm;
5. Largest anterior irregularity on the maxilla in mm;
6. Largest anterior irregularity on the mandible in mm;
7. Anterior maxillary overjet in mm;
8. Anterior mandibular overjet in mm;
9. Vertical anterior open bite in mm;
10. Antero-posterior molar relation: largest deviation from Normal either left or right: 0= normal, 1= half cusp either Mesial or distal, 2= one full cusp or more either mesial or distal.

Each subject is examined and scored for the ten components. Each component is multiplied by its corresponding regression coefficient using the rounded weights. The product is added, and summed up with the regression constant to give the total DAI score. Each subject's DAI score is then placed along the dental aesthetic continuum to determine their percentile score.

The regression equation used for calculating standard DAI score is as follows: (No. of missing visible teeth  $\times$  6) + (crowding) + (spacing) + (diastema  $\times$  3) + (largest anterior maxillary irregularity) + (largest anterior mandibular irregularity) + (anterior maxillary overjet  $\times$  2) + (vertical anterior open bite  $\times$  4) + (anteroposterior molar relation  $\times$  3) + 13 (regression constant) = DAI score. Severity of malocclusion within a population is classified on the basis of the DAI score as follows.

SEVERITY OF MALOCCLUSION	DAI SCORE
Minor or no anomaly: no or slight need	$\leq 25$
Definite malocclusion; elective treatment	26-30
Severe malocclusion; treatment is highly desirable	31-35
Handicapping malocclusion; treatment mandatory	$\geq 36$

Statistical analysis: The data collected was analyzed using SPSS software for windows (version 15.0). Frequency tables were computed. "Chi-square test" was used to test the association between normative orthodontic need and gender, perceived orthodontic need, self-aesthetic perception, social function.

**Results**

Figure 1 shows the distribution of study subjects. Six hundred thirteen (613) 12 year old school children were examined, of which 334 (54.5%) were males and 279 (45.5%) were females.

FIGURE 1. DISTRIBUTION OF STUDY SUBJECTS

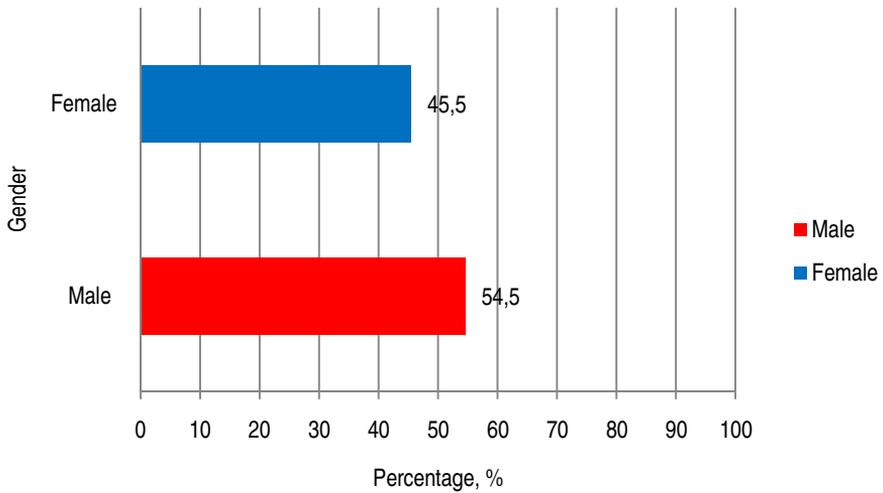


FIGURE 2. MALOCCLUSION SEVERITY LEVELS AMONG THE STUDY SUBJECTS

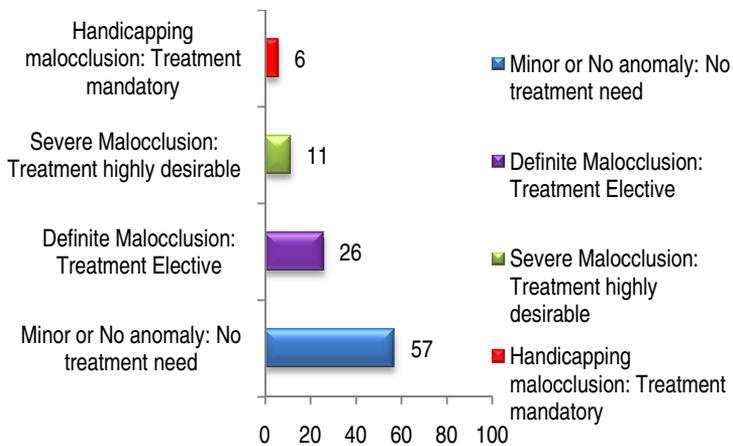


Figure 2 describes the malocclusion severity levels among the study subjects. Of the 613 subjects, 350 (57%) had minor or no anomaly, who do not require any treatment, 158 (26%) had definite malocclusion whose treatment need was elective, 69 (11%) had severe malocclusion, whose treatment need was highly desirable, 36 (6%) had handicapping malocclusion; whose treatment need was mandatory.

TABLE 1. GENDER WISE DISTRIBUTION OF MALOCCLUSION SEVERITY LEVELS

Malocclusion severity levels	Gender		Total N (%)
	Male n (%)	Females n (%)	
Minor or No anomaly: No treatment need	185 (55.4)	165 (59.1)	350 (57.1)
Definite malocclusion: Treatment Elective	85 (25.4)	73 (26.2)	158 (25.8)
Severe malocclusion: Treatment highly desirable	45 (13.5)	24 (8.6)	69 (11.3)
Handicapping malocclusion: Treatment mandatory	19 (5.7)	17 (6.1)	36 (5.9)
Total	334 (100)	279 (100)	613 (100)

Note:  $\chi^2 = 3.651$ , d.f= 3, P = 0.302

TABLE 2. COMPARISON OF NORMATIVE ORTHODONTIC NEED AND PERCEIVED ORTHODONTIC TREATMENT NEED AMONG STUDY SUBJECTS

Normative orthodontic need	Perceived orthodontic need		Total N
	Yes n (%)	No n (%)	
Minor or No anomaly: No treatment need	162 (46.3)	188 (53.7)	350
Definite malocclusion: Treatment Elective	75 (47.5)	83 (52.5)	158
Severe malocclusion: Treatment highly desirable	33 (47.8)	36 (52.2)	69
Handicapping malocclusion: Treatment mandatory	27 (75.0)	9 (25.0)	36
Total (%)	297 (48.4)	316 (51.6)	613

Note:  $\chi^2 = 10.888$ , d.f= 3, P = 0.012

Table 1 describes the gender wise distribution of malocclusion severity levels. Among the study subjects, minor or no anomaly was seen in 350 (57.1%) subjects of which 185 (55.4%) males and 165 (59.1%) females, do not require any treatment, definite malocclusion was seen in 158 (25.8%) subjects of which 85 (25.4%) males and 73 (26.2%) females, whose treatment need was elective, severe malocclusion was seen in 69 (11.3%) subjects of which 45 (13.5%) males and 24 (8.6%) females, whose treatment need was highly desirable, handicapping malocclusion was seen in 36 (5.9%) subjects of which 19 (5.7%) males and 17 (6.1%) females, whose treatment need was mandatory. However, malocclusion severity level among males and females was statistically not significant.

Table 2 describes the comparison of normative orthodontic need and perceived orthodontic treatment need among study subjects. Among the study subjects, minor or no anomaly was seen in 350 (57.1%) subjects of which 162 (46.3%) perceived orthodontic treatment, definite malocclusion was seen in 158 (25.8%) subjects of which 75 (47.5%) perceived orthodontic treatment, severe malocclusion was seen in 69 (11.3) subjects of which 33 (47.8) perceived orthodontic treatment, handicapping malocclusion was seen in 36 (5.9%) subjects of which 27 (75%) perceived orthodontic treatment The normative orthodontic needs and perceived orthodontic needs were statistically significant.

TABLE 3. GENDER WISE COMPARISON OF NORMATIVE AND PERCEIVED ORTHODONTIC NEEDS

Normative orthodontic need <sup>a b</sup>	Perceived orthodontic need					
	Male <sup>a</sup>			Female <sup>b</sup>		
	Yes n (%)	No n (%)	Total N (%)	Yes n (%)	No n (%)	Total N (%)
Minor or No anomaly: No treatment need	103 (55.7)	82 (44.3)	185 (100)	59 (35.8)	106 (64.2)	165 (100)
Definite malocclusion: Treatment Elective	47 (55.3)	38 (44.7)	85 (100)	28 (38.4)	45 (61.6)	73 (100)
Severe malocclusion: Treatment highly desirable	22 (48.9)	23 (51.1)	45 (100)	11 (45.8)	13 (54.2)	24 (100)
Handicapping malocclusion: Treatment mandatory	14 (73.7)	5 (26.3)	19 (100)	13 (76.5)	4 (23.5)	17 (100)
Total	186 (55.7)	148 (44.3)	334 (100)	111 (39.8)	168 (60.2)	279 (100)

Note: <sup>a</sup> $\chi^2= 3.342$ , d.f = 3, p = 0.342, <sup>b</sup> $\chi^2= 11.096$ , d.f = 3, p = 0.011,

Table 3 describes the gender wise comparison of normative and perceived orthodontic needs. 186 males (55.7%) and 111 females (39.8%) perceived orthodontic treatment need. The normative orthodontic needs and perceived orthodontic needs among females were statistically significant, whereas they were not statistically significant among males.

## Discussion

Over the past decade, the psychological and functional perceptions of the patients towards treatments rendered for oral diseases, unaesthetic dental appearance and malocclusion have drawn increasing attention from clinicians and researchers (Kiyak, 2008).

The primary goal of this study was to assess and compare normative and perceived orthodontic need among 12 year old school children in Chennai, India.

Several studies have already been published to describe the prevalence and types of malocclusions in different populations. Comparison of these findings must be done cautiously, because different methods and indices were used in varying age of populations (Nobile Carmelo et al., 2000). The DAI attempted to incorporate patients' perceptions into the index. Unlike the Index of Orthodontic Treatment Need (IOTN), the DAI link the clinical and aesthetic components mathematically to produce a single score that combines the physical and aesthetic aspects of occlusion (Jenny and Cons, 1996). The aesthetic component of the DAI is based on public perception of the dental aesthetics of 200 photographs of the occlusion. The disproportionate, stratified, random sampling procedure used in the selection of the 200 photographs ensured that even the most extreme cases would be represented.

This study was done on 12 year old school children of Chennai. Among 613 subjects examined, 334 were males and 279 females.

The results of this study indicates that 56.3% of the 12 year old school children examined were found to have a dental appearance that required no orthodontic treatment. This is low as compared to other studies conducted among 12-13 year old Malaysian school children (62.6%) (Esa, 2001) and 12-18 year old Nigerian secondary school children (77.4%) (Otuyemi et al., 1999). There appears to be a considerable proportion of the populations (6.2%) with handicapping malocclusion, where treatment is considered mandatory. 37.5% of the study population was with severe to definite malocclusion, where treatment is highly desirable to elective, based on the decision points along the DAI scale.

In the present study of among 12 year old school children the prevalence of malocclusion between genders was statistically not significant. This is consistent with the study among 12-15 year old school children of Davangere city, India (Shivakumar et al., 2010), Nigerian population aged 12-18 years (Otuyemi et al., 1999), Spanish children aged 14-20 years (Baca-Garcia et al., 2004) and Turkish university students aged 17- 26 years (Hamamci et al., 2009). But it was statistically significant in Malaysian school children aged 12-13years.

The most important finding is that normative (malocclusion severity levels of DAI index) and perceived orthodontic treatment need did not overlap, since the dental aesthetic index does not allow an assessment of perceived need and does not predict the demand of orthodontic care. Among the study population, 263 had definite, severe and handicapping malocclusion, only 135 (51.3%) subjects perceived that they need orthodontic treatment. The perceived and normative orthodontic need was statistically significant. This might be due to difference in socio-economic status and lack of awareness about malocclusion.

Although DAI appears to be easy to use, but limitations in this study must be taken into account when interpreting the results. Lack of assessment of traits such as buccal crossbite, open bite, centerline discrepancy and deep overbite is a limitation of this index. In addition, DAI measurements are carried out using a millimeter gauge, and small errors in accuracy can have an exaggerated effect due to the index weightings. There is need to further evaluate aesthetic perception and social function and DAI score relation.

## Conclusion

The prevalence of malocclusion in the present study was 43.7%. At present, orthodontic care is generally provided on the basis of payment by the trained orthodontists, which makes it rather expensive and unaffordable. The most worrisome finding is that normative and perceived orthodontic treatment need did not overlap, since the dental aesthetic index does not allow an assessment of perceived need and does not predict the demand of orthodontic care. Thus there is a need to include assessment of perceived need in the epidemiological studies to estimate demand for orthodontic treatment in particular regions.

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