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Original Research Article

Predicting Orthodontic Treatment Need: Reliability and Validity of the Demand for Orthodontic Treatment Questionnaire among Middle School Students, Makkah, Saudi Arabia

Dr. Arwa Ahmed Fallatah[1*], Dr. Walaa Abdulkareem Altowairqi[2], Dr. Njood Talal Alshareef[3], Dr. Anwar Mohammed Alzahrani[4], Dr. Waleed Ghazi Taju[5], Dr. Sarah Wajdi Taher[6]

[1]General Dentist –Waly Alahd, Mecca, 24353 SA

[2]General Dentist, Taif, SA

[3]General Dentist

[4]General Dentist

[5]Asistant professor in orthodontics at UQUDENT

[6]Asistant professor in orthodontics at UQUDENT

***Corresponding Authors Email: Walaatowairqi@hotmail.com**

Abstract

The objective of this study was to set a pattern predicting orthodontic treatment demand. This is a cross-sectional study where participants were randomly selected from a female teenage population in middle schools in the city of Makkah. The measures were selected from a questionnaire that includes a set of self-assessed measures dealing with self-esteem, Treatment need was assessed by Dental Health Component of the Index of Orthodontic Treatment Need grading. The analysis show that (Perceived Malocclusion, Dental Self-Esteem, need for Dental Comparison, coping with Malocclusion and Treatment Demand) measures are reliable and can indeed predict the need for treatment, as measured by DHC. Perceived Malocclusion, Dental Self-Esteem, need for Dental Comparison, coping with Malocclusion and Treatment Demand) measures are reliable and can indeed predict the need for treatment, as measured by DHC.

Keywords: Malocclusion; Middle School Students, Orthodontic Treatment Need Indices (OTNI), Predicting orthodontic treatment

INTRODUCTION

Discrepancies in dental or skeletal relations lead to malocclusion, however it's been noted that the prevalence of skeletal malocclusion varies depending on the population and ethnic background (Aldrees, 2012). Abnormalities in ideal occlusion is common in children and adolescents, also known as the third most severe problem in the oral cavity (Helm, 1968; Dimberg et al., 2015; World Health Organization, 1962). The patterns of malocclusion vary in different population due to the environmental and genetics influences (Atashi, 2017).

The prevalence of malocclusion has increased recently. Multiple genetic and environmental factors cause malocclusion such as premature loss of teeth, hypodontia, teeth extraction, jaw and teeth size discrepancies (Corruccini, 1984). Para functional habits such as thumb sucking, mouth breathing also contribute to improper occlusal relationship (Zakirulla, 2012). Malocclusion plays a major role in prevalence of dental caries, TMDs and periodontal disease (Proffit et al., 1993).

Studies conducted on the young Saudi Arabian population showed early loss of primary and permanent teeth in accordance with the high caries index of the population, which is a predisposing factor of occlusal abnormality (Satheesh et al., 2014; Nadya et al., 2005; Khan, 2003).

The physical as well as the functional consequences of malocclusion play an important role in determining the need for orthodontic treatment (Mohlin and Kurol, 2003). The functional, social and psychological consequences of malocclusion on a patient are of more importance in considering the need for orthodontic treatment than the

level of deviation from a given norm (Khan, 2003; World Health Organization, 2000; Tsichlaki and O'Brien, 2014).

Socioeconomic factors, cultural background, the patients perceived need for treatment, and expected self-image improvement, has been rapidly increasing the demand for orthodontic treatment (Burden and Holmes, 1994; De Oliveira and Sheiham, 2004).

Several orthodontic treatment need indices were developed, including Occlusal index (OI), treatment priority index (TPI) and Index of Orthodontic Treatment need (IOTN) (Shaw, 1981). However (IOTN) was introduced in 1989, is composed of dental health component (DHC) and aesthetic component (AC), (DHC) was derived from the treatment priority index, however it is scored according to a set of values ranging from (1 - no need for treatment) to (5- great need for treatment), (AC) is scored from (1- no need for treatment) to (10 – need for treatment) (De Oliveira and Sheiham, 2004; Taghavi et al., 2016).

However assessment of orthodontic treatment need should be more reflective of the patient perspectives (Taghavi et al., 2016), for this reason, it's suggested that predetermined self-assessment measures can be used as complementary for clinical diagnosis.

It's been suggested to use a complementary scale along with clinical diagnosis, which solely depends on the patient's perspectives of the need for orthodontic treatment. In this study we test the reliability and validity of self- assessed treatment need questionnaire, according to its correlation with available (DHC) of (IOTN).

AIM OF THE STUDY

To set a pattern predicting orthodontic treatment demand based on self-assessed measures, and detect the correlation of the these measures with the professionally assessed treatment need.

MATERIALS AND METHODS

Design and sample size

This is a cross-sectional study participants were randomly selected from a female teenage population in middle schools in the city of Makkah, Saudi Arabia.

Ethical considerations

All participants and their parents received written informed consent about the study in detail, Ethical approval was obtained (IRB) from the Research Ethics Committee in Saudi Arabia.

Before starting the study, information about the research was given to participants, and the participant were given the right to discontinue at any point.

Subject

Initially 200 randomly selected female adolescents, aged 12-15 years, participated by filling a questionnaire in a paper format on their own.

Inclusion and exclusion criteria

Participants who had any systemic or congenital disorders, previous teeth extraction, and previous orthodontic treatment were excluded from the study.

Measures

The measures were selected from a questionnaire that included self-assessed measures to scale the perceived need for orthodontic treatment, based on a set of predictors such as global and dental self-esteem, perceived malocclusion and perceived functional limitation. Orthodontic treatment need was professionally assessed using Dental Health Component (DHC) of Orthodontic Treatment Need (IOTN) participants scoring 1,2 in (DHC) indicate no need for treatment, while participants scoring 3,4 and 5 in (DHC) indicate a need for treatment. Path analysis was used to examine the validity and reliability of the self-assessed treatment need measures.

Demand for Orthodontic Treatment Questionnaire

The questionnaire was based on the conclusion of a study, that proves the influence of malocclusion on the daily life of adolescents. The questionnaire was written using the guidelines of the health related quality of life by Gill and Feinstein and Locker and Allen as a platform (Gill and Feinstein, 1994; Locker and Allen, 2007).

A previous study used several measures, (N=10) (Bayat et al.,2016). These measure are; 'Psychological and social Dental self-esteem', 'Global self-esteem', 'Social influence', 'Malocclusion related Perceived malocclusion', 'Perceived functional limitation', 'Prioritizing healthy and straight teeth', 'Treatment Demand', 'Dental Fixation', 'Need for Dental Comparison', and 'Coping with Malocclusion'. The Response to each item was scored using psychometric scale of Likert, results were scored ranging from 0 (Do not agree at all) to 4 (Agree fully).

Table 1. Correlations between measures.
DHC = Dental Health Component.

Variables	1	2	3	4	5	6	7	8	9	10
1- Perceived Malocclusion 2-Perceived Functional Limitation	.453**									
3-Prioritizing Healthy and Straight teeth	.017	.006								
4-Social Influence	.461**	.407**	.113							
5-Dental Self-Esteem	.023	.024	.122	.128						
6-Global Self-Esteem	.049	.178*	.054	.200**	.225**					
7-Dental Fixation	.312**	.344**	.026	.562**	.088	.070				
8-Need for Dental Comparison	.271**	.225**	.028	.465**	.086	.138	.550**			
9-Coping with Malocclusion	.249**	.267**	.036	.419**	.060	.141*	.587**	.416**		
10-Treatment Demand	.353**	.253**	.011	.474**	.020	.002	.547**	.305**	.467**	
11- DHC	.404**	0.152	0.054	.021	.329**	0.031	.0.011	.156*	.377**	.380**

*$P < 0.05$ (two-tailed).
N= 200

Table 2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.546	0.298	0.284	3.2147
2	.626	.392	.363	2.58843

Model 1 Predictor: Perceived Malocclusion
Model 2 predictors Perceived Malocclusion, Coping with Malocclusion, treatment demand, Need for Dental Comparison - Dental Self-Esteem.

Table 3. indicating the summary of multiple regression analysis with DHC as the dependent variable and the measures in DOTQ as independent variables for the total sample. β = Unstandardized regression coefficient, measuring how strongly each independent variable, predictor, influences the dependent variable; Negative β = negative relationship; DHC = Dental Health Component; DOTQ = Demand for Orthodontic Treatment Questionnaire.

Variables	β	T	P
Constant	0.87	3.201	0.000
1- Perceived Malocclusion	0.74	2.14	0.021
2-Perceived Functional Limitation	0.012-	0.251-	0.412
3-Prioritizing Healthy and Straight teeth	0.015-	0.451-	0.254
4-Social Influence	0.043	0.987	0.321
5-Dental Self-Esteem	0.35	2.13	0.01
6-Global Self-Esteem	0.023	0.213	0.451
7-Dental Fixation	0.013	0.236	0.265
8-Need for Dental Comparison	0.64	3.25	0.08
9-Coping with Malocclusion	0.42	3.44	0.01
10-Treatment Demand	0.60	3.12	0.01

RESULTS

Table (1) represents a correlation between Treatment Need as measured by DHC and the Demand for Orthodontic Treatment Questionnaire (DOTQ).

The results indicated that there were positive significance relationship between Treatment Need as measured by DHC and Perceived Malocclusion (r=0.404, p<0.05), Dental Self-Esteem (r=0.329, p<0.05), Need for Dental Comparison (r=0.0.156, p<0.05), Coping with Malocclusion (r=0.377, p<0.05) and Treatment Demand (r=0.380, p<0.05), on the other hand the results indicated that there is no correlation between Treatment Need as measured by DHC and Perceived Functional Limitation, Prioritizing Healthy and Straight teeth, Social Influence, Global Self-Esteem and Dental Fixation.

Regression analyses

A Regression analysis was done using all the variables in this study, including Treatment Demand, as the

independent variables and DHC as the dependent variable for the total sample. The results are presented in table (2) and showed that the independent variables expressed 39.2 per cent of the variance in DHC ($R = 0.626$, $P < 0.01$).

Table-2 also explains the unstandardized regression coefficients for this model. Moreover, a it revealed that only Perceived Malocclusion, treatment demand, Coping with Malocclusion, Need for Dental Comparison, dental Self-Esteem, had significant impact to the prediction of treatment need as measured by DHC.

The coefficients above can be used to calculate predicted DHC for each individual by the following formula: Constant (see above) + [the individual's score on each measure (results from Questionnaire) × Unstandardized β coefficient for respective measure] = Predicted treatment need

Predicted treatment need = 0.87+ 0.74x Perceived Malocclusion + 0.35 x Dental Self-Esteem + 0.64x Need for Dental Comparison+ 0.42x Coping with Malocclusion + 0.60 X Treatment Demand.

DISCUSSION

The analysis show that (Perceived Malocclusion, Dental Self-Esteem, Need for Dental Comparison, Coping with Malocclusion and Treatment Demand) measures are valid and can predict the treatment need, as measured by DHC. With the highest significant correlation in (Perceived malocclusion and Dental self-esteem). the results indicate less correlation between DHC results and the other measures (Perceived Functional Limitation, Prioritizing Healthy and Straight teeth, Social Influence, Global Self-Esteem and Dental Fixation). A similar study conducted by Taghavi et al. (2016), showed comparable results, there was a significantly high correlation between perceived malocclusion and DHC results (Taghavi et al., 2016).

Another study conducted in Jeddah, Saudi Arabia studied the level of agreement between the patient's and the clinician's decision in orthodontic treatment need based on components of IOTN, participants perceived need for orthodontic treatment was measured using IOTN – AC, then it was compared to the professional assessed need using the same measure. However there was a positive but weak correlation between patient's perception of malocclusion and the dentist's decision (Salwa et al., 2019).

Ali H Hassan, conducted a study in 2006, used patient's assessment of IOTN – AC and compared it to the professional assessment of IOTN – AC, DHC. However it concluded that there was a mismatch between the patient's perception of orthodontic treatment need, and the definitive orthodontic treatment need. The study also noted that self perception of orthodontic treatment need was significantly different in patients pursuing orthodontic treatment in private dental care, and those who pursue treatment in governmental free dental care (Ali and Hassan, 2006).

However these studies were based on the aesthetic component of orthodontic treatment need, as aesthetic is one of the major factors leading patients to seek treatment. Yet, it is not the only predictor. As been mentioned in this study other factors may contribute to the patient's perceived need for treatment such as perceived malocclusion, dental self-esteem, need for dental comparison, coping with malocclusion and treatment demand which is measured by IOTN.

Studies have shown that children perception of orthodontic treatment need didn't match the dentists' professional view. As it is needed for individuals to be 13 years or older to be able to recognize and discus dental occlusion and aesthetics (Shaw, 1981; (Birkeland et al., 1999; Christopherson et al., 2009; Deli et al., 2012; Bos et al., 2005).

OHRQoL instruments support the perceived need for orthodontic treatment according to some studies; while normative indexes do not include the patients' views.

Normative indices such as IOTN have been combined with generic OHRQoL measures, in an attempt to improve the selection process and predictability of the conclusion results (Josefsson et al., 2007).

Accordingly, other normative indices such as the Swedish Medical Board Index (SMBI), can give substandard outcome when used in assessing borderline cases treatment need. Also, when evaluation of inter-examiner reliability between six orthodontic consultants was done, no full agreement obtained except for one third of the cases (Borzabadi-Farahani et al., 2009; Perillo et al., 2010).

Inter-examiner variability has also been found when evaluating treatment need in 11-year-old children with 'borderline' malocclusions among Danish orthodontist (Dimberg et al., 2015).

However this study demonstrated a significant positive correlation between some components of the orthodontic treatment questionnaire and the definitive need for treatment, while showed no correlation with other components in the same questionnaire. However patient's assessed orthodontic treatment questionnaire may need to be further studied and modified to meet the required precision.

CONCLUSIONS

Significant positive relation was noted in perceived malocclusion, dental self-esteem, need for dental comparison, coping with malocclusion and treatment demand which makes it reasonable to assesst predicting orthodontic treatment need. No correlation was found in other components perceived functional limitation, prioritizing healthy and straight teeth, social influence,

global self-esteem and dental fixation which could be aimed for further studies and modification.

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