

# Prevalence of Malocclusion in the Southern Region of Jeddah, KSA, and Its Impact on Quality of Life - A Cross-Sectional Study

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## ABSTRACT

### BACKGROUND

Dental malocclusion not only affects the functional abilities and aesthetic features of an individual, but also affects the psychological status of an individual. The study aims to address the necessity of orthodontic treatment using the Orthodontic Treatment Needs Index (IOTN) and its influence on the individual's quality of life using the Oral Health Impact Profile (OHIP-14) Index on adults undergoing dental treatment in Ibn Sina National college, dental clinics.

### METHODS

401 adult subjects undergoing treatment at Ibn Sina National College, dental clinics were selected randomly for the study. The subjects were examined by 5 calibrated dentists. For each patient, two indices, IOTN and OHIP-14 were recorded. Each subject's relationship of teeth was recorded on a dental chair equipped with natural and dental light. Angle's molar and canine classification, overjet, overbite were recorded to reach an IOTN score. The influence on quality of life was determined using the OHIP-14 index by asking questions regarding functional limitation, physical pain and disability, and social discomfort.

### RESULTS

Out of 401 participants, 57.4 % were females and 42.6 % were males. The mean age of the participants was found to be  $29.94 \pm 10.75$  years. The functional limitations for pronouncing words among the participants were statistically significant. Physical pain and disability, psychological discomfort and disability, as well as social disability domains showed a statistically significant association, whereas the relationship of handicapped with IOTN grades were not statically significant ( $P < 0.001$ ).

### CONCLUSIONS

Prevention is better than cure. Masticatory difficulty has been noted among class III, class II, and class I malocclusions respectively in descending order with class III facing the most difficulty. It has been noted that malocclusion in different scales affected individual's ability to process and break down food. Early diagnosis and treatment are important.

### KEY WORDS

Malocclusion, OHIP, IOTN, Orthodontic Treatment, Quality of Life.

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**BACKGROUND**

Due to recent advances in the field of orthodontics, concerns from the general society regarding aesthetics, and general form and appearance, the demand for orthodontic therapy has significantly increased. Patients usually desire orthodontic treatment to improve function and aesthetics, rather than the purpose of treating oral “disease.”<sup>1</sup>

The main reason for orthodontic treatment is to enhance patient’s aesthetics. However, the need for orthodontic treatment is influenced by the patient’s perception and the orthodontist clinical examination, this will increase awareness of the patient’s “situation.”<sup>2,3</sup> Two indices were used to evaluate the degree of treatment needed: IOTN and the OHIP.

Over the past years, few studies have been done in the Western region of Saudi Arabia to classify the degree of malocclusion on young individuals and the orthodontic treatment needs using the IOTN “index,”<sup>4,5,6</sup> in this study sole focus was on part of the Western region localised to Southern area of Jeddah, KSA.

Malocclusion can have some negative psychological impact on the individual. It can be devastating and dramatically affects quality of life of an individual, research has shown a significant improvement in quality of life post orthodontic “treatment.”<sup>7,8</sup> Malocclusion not only affects the aesthetic and functional abilities of an individual; psychological aspect of the individual is affected as well influences the self-esteem, socialising and inter-personal relationship of the individual; so, the oral health related quality of life will be affected. Hence, this study was planned to analyse the effects of malocclusion on an individual well-being.

**METHODS**

This study is a cross-sectional evaluation of adult patients undergoing treatment at Ibn Sina National College in Jeddah, Saudi Arabia. Research data collection initiated after obtaining approval from institutional ethics committee, Ibn Sina National College for Medical Studies (IEC Reference Number: H-02-22122019). Subjects were examined by 5 calibrated dentists after signing an informed consent. A calculated sample size of 401 adult subjects undergoing treatment were selected randomly and for each patient 2 indices were recorded: Orthodontic-Treatment Need Index and Oral Health Impact Profile-14.

Patients with the following conditions were excluded

1. Severe dento-facial anomalies
2. Cleft lip and palate
3. Past orthodontic treatment
4. Those requiring orthognathic surgeries
5. Serious medical conditions.

Patients with the following conditions were included

1. No previous history of orthodontic therapy
2. Subjects who were 14 years old and above, with fully erupted permanent second molars
3. Medically fit patients.

Written informed consent was obtained from each subject, armamentarium used were basic diagnostic kit, dental chair equipped with natural and dental light.

**Malocclusion Assessments**

It was done by using the Orthodontic Treatment Need Index. IOTN is a rating system that is aimed to determine the impact of malocclusion and severity on dental health. It gives a priority for the individuals who need treatment the most.<sup>9</sup> And it was done with the use of natural light, dental light and diagnostic kits.

Severity of each participants was recorded through components of IOTN which are: Grade 1: implies no treatment need, Grade 2: implies mild or little need, Grade 3: implies moderate or borderline treatment need, and Grades 4 & 5: implies severe or extreme treatment need.

The questionnaires using OHIP-14 covered the seven domains of oral health: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Appendix B shows the OHIP questionnaire.<sup>1</sup>

**Statistical Analysis**

The data obtained was transferred to the Microsoft Excel and subjected to statistical comparison. Data processing was done through statistical analysis software, Statistical Package for the Social Science.

SPSS version 23 (IBM corps, Armonk, NY, USA). Descriptive analysis of the data was performed. Pearson’s chi-square test was performed to correlate in the IOTN and the OHIP-14.

**RESULTS**

Our study consisted of a total of 401 participants, of whom 57.4 % were females and 42.6 % were males. The mean age of the participants was found to be 29.94 ± 10.75 years (Table 1).

When we assessed the distribution of IOTN grades, it was found that 39.7 % had grade 1, 36.7 % had grade 2, 16.7 % had grade 3, 5.7 % had grade 4 and 1.2 % had grade 5 (Table 2). When the relationship of the gender with different grades of IOTN was analysed, there was no statistically significant association observed ( $X^2 = 1.613, P > 0.05$ ) (Table 2)

	N	Mean	Std. Deviation	Minimum	Maximum
Female	230	29.83	10.68	14.00	66.00
Male	171	30.07	10.89	6.00	75.00
Total	401	29.94	10.75	6.00	75.00

*Table 1. Mean Age of the Participants*

The evaluation of functional limitations among the participants showed that 25.56 % had reported the same. It was found that grade 3, 4 and 5 had comparatively more troubles in pronouncing some words than grade 1 and 2 which showed a statistically significant relationship ( $X^2 = 21.94, P < 0.001$ ) (Table 3).

When we assessed the domain ‘physical pain’, it was found that 28.5 % had reported having some form of physical pain. Except for participants with grade 1 all other grades of IOTN in our study had reported aching in the mouth ( $X^2 = 18.46, P < 0.05$ ) and also felt some pain while having food ( $X^2 = 35.2, P < 0.001$ ), which showed a statistically significant association. (Table 3)

		IOTN Grading Index					Total	Pearson's Chi-Square	P-Value
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5			
Gender	Female	95 (41.3 %)	85 (37.0 %)	36 (15.7 %)	11 (4.8 %)	3 (1.3 %)	230 (100 %)	1.613	0.806
	Male	64 (37.4 %)	62 (36.3 %)	31 (18.1 %)	12 (7.0 %)	2 (1.2 %)			

**Table 2. Distribution of IOTN Grades Based on Gender**

Level of significance P < 0.05

		IOTN Grading Index					Total	X <sup>2</sup>	P Value	
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5				
Functional limitation	Have you had any troubles pronouncing any word?	Yes	38 35.5 %	28 26.2 %	27 25.2 %	10 9.3 %	4 3.7 %	107 100 %	21.94	< 0.001
		No	121 41.2 %	119 40.5 %	40 13.6 %	13 4.4 %	1 0.3 %			
	Have you felt that your sense of taste has worsened?	Yes	33 33.7 %	39 39.8 %	14 14.3 %	9 9.2 %	3 3.1 %	98 100 %	8.08	0.089
		No	126 41.6 %	108 35.6 %	53 17.5 %	14 4.6 %	2 0.7 %	303 100 %		
Physical pain	Have you had any painful aching in your mouth?	Yes	30 26.5 %	45 39.8 %	24 21.2 %	10 8.8 %	4 3.5 %	113 100 %	18.46	0.001
		No	129 44.8 %	102 35.4 %	43 14.9 %	13 4.5 %	1 0.3 %	288 100 %		
	Have you found it uncomfortable eating any food?	Yes	28 24.1 %	44 37.9 %	25 21.6 %	17 14.7 %	2 1.7 %	116 100 %	35.20	< 0.001
		No	131 46.0 %	103 36.1 %	42 14.7 %	6 2.1 %	3 1.1 %	285 100 %		
Psychological discomfort	Have you been self-conscious about your oral status?	Yes	21 19.3 %	42 38.5 %	30 27.5 %	12 11.0 %	4 3.7 %	109 100 %	40.16	< 0.001
		No	138 47.3 %	105 36.0 %	37 12.7 %	11 3.8 %	1 0.3 %	292 100 %		
	Are you tense regarding problems in your occlusion?	Yes	26 25.7 %	48 47.5 %	14 13.9 %	11 10.9 %	2 2.0 %	101 100 %	18.428	0.001
		No	133 44.3 %	99 33.0 %	53 17.7 %	12 4.0 %	3 1.0 %	300 100 %		

**Table 3. Responses of Participants Regarding Functional Disability, Physical Pain, and Psychological Discomfort Based on IOTN Grades**

Level of significance P < 0.05

		IOTN Grading Index					Total	X <sup>2</sup>	P Value	
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5				
Physical disability	Has your diet been unsatisfactory?	Yes	25 28.1 %	37 41.6 %	18 20.2 %	5 5.6 %	4 4.5 %	89 100 %	15.134	0.004
		No	134 42.9 %	110 35.3 %	49 15.7 %	18 5.8 %	1 0.3 %	312 100 %		
	Did you interrupt a meal before due to your condition?	Yes	26 26.3 %	39 39.4 %	18 18.2 %	13 13.1 %	3 3.0 %	99 100 %	22.270	< 0.001
		No	133 44.0 %	108 35.8 %	49 16.2 %	10 3.3 %	2 0.7 %	302 100 %		
Psychological disability	Have you found it difficult to relax?	Yes	27 23.1 %	46 39.3 %	27 23.1 %	13 11.1 %	4 3.4 %	117 100 %	30.346	< 0.001
		No	132 46.5 %	101 35.6 %	40 14.1 %	10 3.5 %	1 0.4 %	284 100 %		
	Are you embarrassed even a bit with your oral status?	Yes	27 24.3 %	47 42.3 %	21 18.9 %	13 11.7 %	3 2.7 %	111 100 %	23.060	< 0.001
		No	132 45.5 %	100 34.5 %	46 15.9 %	10 3.4 %	2 0.7 %	290 100 %		

**Table 4. Relationship of Physical Disability and Psychological Disability with IOTN Grades**

Level of significance P < 0.05

		IOTN Grading Index					Total	X <sup>2</sup>	P Value	
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5				
Handicap	Have you felt that life in general was less satisfying because of your condition?	Yes	29 31.2 %	34 36.6 %	17 18.3 %	10 10.8 %	3 3.2 %	93 100 %	11.485	0.022
		No	130 42.2 %	113 36.7 %	50 16.2 %	13 4.2 %	2 0.6 %	308 100 %		
	Have you been totally unable to function because of problems related to your condition?	Yes	22 27.8 %	32 40.5 %	17 21.5 %	6 7.6 %	2 2.5 %	79 100 %	7.122	0.130
		No	137 42.5 %	115 35.7 %	50 15.5 %	17 5.3 %	3 0.9 %	322 100 %		
Social disability	Have you had any troubles pronouncing any word?	Yes	21 (18.8 %)	49 (43.8 %)	24 (21.4 %)	15 (13.4 %)	3 (2.7 %)	112 (100.0 %)	39.76	< 0.001
		No	138 47.8 %	98 33.9 %	43 14.9 %	8 2.8 %	2 0.7 %	289 (100.0 %)		
	Have you felt that your sense of taste has worsened?	Yes	24 (27 %)	35 (39.3 %)	16 (18.0 %)	12 (13.5 %)	2 (2.2 %)	89 (100.0 %)	17.86	< 0.001
		No	135 43.3 %	112 35.9 %	51 16.3 %	11 3.5 %	5 1.2 %	312 (100.0 %)		

**Table 5: Relationship of Handicap with IOTN Grades and Response of Participants Regarding Social Disability**

Level of significance P < 0.05

It was found that 26.18 % had some kind of psychological discomfort among our participants. 86.79 % (n = 138) of participants who had IOTN as grade 1 were not self-conscious about their oral status and also 83.6 % of grade 1 (n = 44.3 %) were not tensed regarding their occlusion compared to other grades of IOTN that showed statistically significant association (Table 3)

When the responses related to the domain 'physical disability' was recorded it was found that 89 (22.19 %) participants had unsatisfactory diet and 99 (24.68 %) participants had reported that they had an interrupted meal due to their condition. Participants with grade 1 were comparatively having no physical disability compared to those with higher grades of IOTN that showed statistically significant association. (Table 4).

The assessment of psychological disability among participants showed that those who had grade 1 IOTN showed comparatively little disability to other higher grades (P < 0.001) (Table 4).

When we evaluated the responses regarding being handicapped, it was found that 21.44 % of the participants were handicapped in some ways. When the relationship of IOTN and handicapped was assessed it was observed that people with grades 1 and 2 had reported comparatively satisfied life than those with higher grades of IOTN. (Table 5)

When the domain 'social disability' was assessed, it was found that participants with grade 1 had comparatively less problems related to social disability, whereas grade 2, 3, 4, 5 individuals reported more issues with this domain, and this was statistically significant. (P < 0.001) (Table 5).

## DISCUSSION

The perception of beauty has transformed among the users of social media, which led to lack of acceptance of malocclusion and admiration of the Hollywood smile. According to OHIP questionnaire, moderate to severe malocclusion that was untreated showed a negative reflection on quality of life.

In our study, the mean age was  $29.94 \pm 10.75$  years. "Choi et al.<sup>10</sup>" evaluated 472 patients aged 21.1 years who visited their department in Seoul, Korea, which had a similar age group as our study.

Choi et al. concluded that severe malocclusion was more in patients visiting the dental hospitals compared to the private clinics. They also reported that lower quality of life and masticatory efficiency was correlated to more severe malocclusion in older patients. Jamilian et al.<sup>11</sup> reported that moderate to severe malocclusion had less negative impact after orthodontic treatment, whereas our study has excluded pre-orthodontically treated patients.

In our study, we evaluated the severity of malocclusion between genders and found that the relationship between the gender and the grade of IOTN shows that there is no remarkable association.

Barakat et al.<sup>12</sup> referred that quality of life was not overall affected as long as functional ability and aesthetics was not "compromised."<sup>13</sup> But in our study we viewed the functional disability participants with grade 3, 4 and 5 showed troubles in pronouncing words (Table 3). And for the physical pain all

grades reported physical pain in their mouth except grade 1 and also pain while chewing food. (Table 3) This is similar to the findings of previous studies.

Our study estimated in regard to psychological discomfort all the participant were self-conscious about their oral status except those who were classified as grade 1 and those who complained of being tensed regarding problems with their occlusion varied from grade 2, 4 and 5 (Table 3).

Our study calculated the physical disability participants with grade 2, 3 and 5. They have been unsatisfied about their diets, all the participants reported that they interrupted their meal due to their condition except grade 1 (Table 4).

Based on psychological disability in our study, participants who had disability to relax and were embarrassed of their oral status were from grade 2 to 5 (Table 4).

In our study, we assessed the relationship of handicap with IOTN people with grade 2, 3 and 5. They felt that their life in general was less satisfying due to their condition and people with grade 2, 3, 5 said that they were unable to function because of the problems related to their conditions except grade 1 (Table 5). The domain handicap does not refer to the functional disability but to the negative impact on social life and self-perceptions.

To determine the social disability in our study, participants with grade 2, 3, 4, 5 were compared to those of grade 1 (Table 5). This highlights the social impact on quality of life of malocclusions individuals.

Orthodontists should fulfil the need of their patients for orthodontic treatment, not only for functioning, but also to escalate their self-esteem and aesthetics, especially the patients in Southern Jeddah are not aware of the importance of orthodontic treatment and mostly cannot afford it. When these needs are not met it leads to dissatisfaction and negatively affect their social life, This study focuses of the treatment needs in the area and its impact on quality of life and how such matter affects individuals social status among the community.

Data obtained from this research may be used in future researches to calculate manpower required in the area to perform required treatments.

## CONCLUSIONS

Malocclusions were almost similar in both genders although the physiological impact on quality of life was more evident in female patients. Masticatory difficulty has been noted among class III, class II, and class I malocclusions respectively in descending order with class III facing the most difficulty. It has been noted that malocclusion in different scales affected individual's ability to process and break down "food."<sup>14</sup> Early diagnosis and treatment must be implemented to avoid disappointment of any sort to individual's life in the future; the matter of urgent need to educate parents with school age children regarding malocclusion and the importance of early treatment must be a priority in public health programs to prevent future psychological distress among individuals of the society. According to results, more severe malocclusions demonstrated lower quality of life and masticatory efficiency.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

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