

## Correlation between dental aesthetic index and orthodontics-related quality of life among students in south-east of Iran

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Orthodontic treatment aims mainly to improve orodental healthcare and function, but its aesthetic and psychological effects are increasing as well. The aim of the present study was to evaluate the correlation between Dental Aesthetic Index (DAI) and orthodontics-related quality of life (QOL) among first course high school students in Kerman, Iran.

**METHODS:** The present cross-sectional descriptive study was conducted on 400 first course high school students selected through two-stage cluster sampling method during 2017 to 2018. Data were collected using 22-item orthodontics-related QOL and DAI questionnaires, and then analyzed by SPSS software using analysis of variance (ANOVA) and linear regression tests. P-value was considered at significance level of 0.05.

**RESULTS:** According to DAI score, 15.7% of students needed mandatory orthodontic treatment and 39.4% had no orthodontic or minor treatment. Mean orthodontics-related QOL score was  $15.60 \pm 11.16$  out of 88. No significant correlation was found between total score of questionnaire, items of DAI, DAI score, and different domains of questionnaire with DAI. Moreover, there was no significant difference between gender, DAI, and the mean score of orthodontics-related QOL questionnaire.

**CONCLUSION:** Based on the results of the present study, the orthodontics-related QOL was high in first course high school students. Additionally, no statistical correlation was reported between DAI and orthodontics-related QOL and corresponding domains.

**KEYWORDS:** Malocclusion; Quality of Life; Treatment Need; Students

**Citation:** Torabi-Parizi M, Karimi-Afshar M, Mashayekhi F, Karimi-Afshar M, Aminian A. **Correlation between dental aesthetic index and orthodontics-related quality of life among students in south-east of Iran.** J Oral Health Oral Epidemiol 2020; 9(1): 16-23.

Malocclusion can cause psychosocial problems, appearance-related discrimination, and problems with function of oral cavity.<sup>1</sup> Psychosocial consequences of unacceptable dental appearance can be as important as or even more significant than biologic problems.<sup>2-5</sup> Malocclusion is one of the oral problems affecting the physical, social, economic, and psychological aspects of a person.<sup>3,4</sup> Occlusal problems cannot be defined only by physical factors, but psychosocial

consequences of unacceptable dental appearance can be as important as or even more significant than biologic problems.<sup>5</sup>

In modern orthodontics, the number of people who come to orthodontic treatment centers to improve their psychosocial problems in relation to facial appearance have increased more than the past. In the project of orthodontic treatments, more importance is given to the aesthetic issue and the facial appearance as a therapeutic goal.<sup>1</sup>

The malocclusion and dental deformities

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are very common and their psychosocial effects are an important stimulus for orthodontic treatment.<sup>6,7</sup> Hence, oral health related QOL can be used as a measure of orthodontic treatment need.<sup>8-10</sup> Dental Aesthetic Index (DAI) is an indicator in epidemiological research to assess treatment need. One of the distinguishing aspects of this index is the presentation of aesthetic and physical features of malocclusion as a single value.<sup>11</sup> This index focuses on assessing dentofacial problems, including missing, crowding, diastema, overjet, reverse overjet, open bite, and molar relationship. World Health Organization (WHO) has accepted it as a cross-cultural index and a model for pathfinder surveys.<sup>12</sup>

A systematic and meta-analytic review concluded that malocclusions were significantly associated with oral health-related QOL (OHRQOL).<sup>13</sup> Adolescent patients are extremely worried about their own physical image, which has a major role in psychosocial compromise and academic achievement and can affect QOL. Considering that no research similar to this study has been done so far, this research was conducted to assess the correlation between DAI and orthodontics-related QOL among first course high school students in Kerman, Iran.

## Methods

The present cross-sectional descriptive analytic study was conducted on 400 first course high school students in Kerman, who were chosen through two-stage cluster sampling method during November 2017 to June 2018. First, the city was divided into five districts, including north, south, east, west, and center. After obtaining the necessary education licenses, two high schools were chosen from each of the above districts, and a number of students randomly selected from each of the schools from the first, second, and third grades were examined. The selection of individuals continued to reach the sample size from each course. Exclusion criteria were

orthodontic treatment in the past or at the time of study, unwillingness to participate in the study, history of severe periodontal problems, previous extraction, chronic medical problems, or craniofacial anomalies.<sup>14</sup> Data collection tools included the clinical examinations and questionnaires, including demographic information and orthodontics-related QOL questionnaire.

After obtaining the necessary permissions, a trained senior student capable of responding and resolving any uncertainties initially provided an adequate explanation for study objectives and methodology in the classroom of students. After obtaining consent, the students were examined for occlusion using a disposable mirror and gauge and information was recorded. Examinations took place under supervision of school health educators in the school hygiene room on a normal seat under natural light. The number of visible missing teeth, crowding in the incisal segment, spacing in the incisal segment, midline diastema, the maximum anterior irregularities in millimeters, overjet, reverse overjet, open bite, and molar relationship were evaluated. Then, each criterion was multiplied by the corresponding linear value coefficient, whose sum with a constant number of 13 determined the final DAI value. The numerical values of DAI were categorized into four grades. Grade 1 ( $DAI \leq 25$ ) shows normal occlusion or mild malocclusion without any need for orthodontic treatment. There is a definite malocclusion and the need for selective treatment in grade 2 ( $DAI = 26-30$ ). There is a severe malocclusion and severe need for treatment in grade 3 ( $DAI = 31-35$ ). Grade 4 ( $DAI \geq 36$ ) shows very severe malocclusion and compulsory treatment.<sup>15</sup>

The orthodontics-related QOL questionnaire includes 22 questions in four domains: 1- social aspects (questions 15, 16, 17, 18, 19, 20, 21, 22) with score range of 0-32, 2- dentofacial aesthetic domain (questions 1, 7, 10, 11, 14) with score range of 0-20, 3- oral function (questions 2, 3, 4, 5, 6) with score

range of 0-20, and 4- knowledge of facial-dental aesthetics (questions 8, 9, 12, 13) with score range of 0-16. It was scored on the basis of 5-point Likert scale, indicating never (0), few (1), somewhat (2), high (3), and very high (4). Therefore, the score range was 0-88. A lower score indicates better QOL. Momeni Danaei et al. verified this questionnaire with Cronbach's alpha (reliability) of 0.86 and weighted kappa (validity) of 0.91.<sup>16</sup>

The collected data were analyzed by SPSS software (version 21, IBM Corporation, Armonk, NY, USA) using frequency distribution tables, analysis of variance (ANOVA), and linear regression analysis. The significance level was considered to be 0.05. This study was approved with code of IR.KMU.REC.1396.1709 at the Ethics Committee of Kerman University of Medical Sciences.

## Results

The findings of this cross-sectional descriptive analytic study, which was conducted on 400 first course high school students, were as follows: The low answer of "very high" was related to the items: "I have a problem with chewing" and "I refrain from eating some food because the contact of my teeth with each other makes it difficult to eat them", which were not answered by none of the girls.

Moreover, 22.02% of people gave maximally the answers of "high" and "very high" to the question "I spend a lot of time checking my face in mirror" in the domain of

knowledge of dentofacial aesthetics. In addition, 17.50% marked the answers of "high" and "very high" to the question "Commenting on my appearance is really annoying to me, even when I know that others are just going to joke about it" in the social domain. Additionally, 14.15% of them gave the answers of "high" and "very high" to the question "I spend a lot of time checking my teeth in the mirror". In the dentofacial aesthetic domain, the mean score in both girls and boys was  $3.73 \pm 3.63$  and  $3.09 \pm 2.56$  out of 20, respectively.

Table 1 shows how to answer the questions. In knowledge of dentofacial aesthetics domain, in response to question 8 "I spend a lot of time looking at my face in the mirror", 11.9% of girls and 10.5% of boys gave the answer of "very high".

The way of answering each question is shown in table 2. The mean and standard deviation (SD) of knowledge of aesthetics in girls and boys was  $4.85 \pm 3.24$  and  $3.84 \pm 2.99$  out of 16. In the context of oral function in responding to the question "I do not like eating in public places", 6.0% of boys and 3.5% of girls gave the answer of "very high".

How to respond to answer each question separately is shown in table 3. In the domain of the oral function, the mean score for boys and girls, respectively, were  $2.33 \pm 1.75$  and  $2.66 \pm 1.96$  out of 20. In the social domain, in response to question 17 "I am worried about giving people an unpleasant view of my appearance", 10.0% of girls and 0.12% of boys gave the answer of "very high".

**Table 1.** The frequency distribution percentage of participants' responses in facial aesthetic domain

Questions	Never		Few		Somewhat		High		Very high	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
I am self-conscious about the appearance of my teeth	57.5	61.7	27.0	28.4	9.5	7.0	3.0	2.5	3.0	0.5
I do not like seeing a side view of my face	71.0	62.7	10.6	13.9	4.0	11.9	5.5	4.5	3.5	4.5
I dislike having my photograph taken	73.0	58.3	12.0	17.4	5.5	10.9	4.0	5.5	5.5	7.5
I dislike being seen on video	71.0	50.2	17.5	22.4	4.5	12.9	3.5	5.5	3.5	9.0
I am self-conscious about my facial appearance	73.5	63.2	18.0	22.9	2.0	6.0	5.0	5.0	1.5	1.5

**Table 2.** The frequency distribution percentage of participants' responses in knowledge of aesthetic domain

Questions	Never		Few		Somewhat		High		Very high	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
I spend a lot of time checking my face in the mirror	35.5	22.4	30.5	23.9	16.5	27.4	7.0	13.9	10.5	11.9
I spend a lot of time checking my teeth in the mirror	41.5	26.4	28.0	31.8	17.0	24.4	5.5	12.4	8.0	3.0
I often stare at other people's teeth	63.0	52.2	23.5	25.9	5.0	10.9	2.0	7.0	3.5	3.5
I often stare at other people's faces	45.0	42.3	28.5	27.9	16.0	16.9	5.0	8.5	5.5	4.0

How to answer for each question is shown in table 4. The mean score of the social domain in boys and girls was  $6.80 \pm 5.79$  and  $6.26 \pm 6.00$  out of 32, respectively.

The mean score of the orthodontics-related QOL questionnaire and the score of each of the respective domains is shown in figure 1. No statistically significant difference was found in the score of orthodontics-related QOL and each of the respective domains between girls and boys.

In this study, 10.25% of people had the missing teeth, 43.25% in the mandibular regions had crowding, and 81.85% had no diastema in the anterior mandible. The anteroposterior molar relationship was normal in 37.6% and in 21.70%, it was a cusp or more abnormal.

The treatment need according to DAI is shown in figure 2. 16.90% of girls and 14.50% of boys had essential need for the orthodontic treatment. The total score for the questionnaire was  $16.59 \pm 11.47$  for girls and  $14.56 \pm 11.76$  for boys. There was no significant difference between orthodontic treatment need with each of the domains of the orthodontics-related QOL questionnaire and the total score of orthodontics-related QOL in boys and girls and the whole

population studied (Table 5).

The regression test showed no significant difference between the total score of the questionnaire, DAI grades and total score of DAI, and the different domains of the questionnaire with DAI grades.

## Discussion

The malocclusion affects the physical, social, economic, and psychological dimensions of the person.<sup>5,17</sup> The DAI is a research tool for assessing a patient's dental aesthetics based on community norms to examine socially-acceptable dental appearance. This index provides the ability to compare individuals based on aesthetic score using objective measurements of psychological and social performance, and is highly useful for studying the influence of malocclusion on social and mental conditions.<sup>18</sup>

In our study, 39.4% of students had DAI < 25. The rate was reported to be 49.8% for Brazilian teens,<sup>15</sup> 58.6% in Spain,<sup>19</sup> and 20.8% in Turkey.<sup>20</sup> No or slight need for orthodontic treatment exists in 48.3% of adolescents aged 14-18 years old in Shiraz, Iran<sup>21</sup> and 54.5% of teenagers in Isfahan, Iran,<sup>22</sup> which is consistent with the findings of this study.

**Table 3.** The frequency distribution percentage of participants' responses in oral function domain

Questions	Never		Few		Somewhat		High		Very high	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
I have problems biting	81.0	79.6	12.0	10.9	4.0	4.5	1.0	4.5	2.0	0.5
I have problems chewing	86.0	87.1	6.5	9.5	2.0	3.0	4.0	0.5	1.5	0
There are some foods I avoid eating because the way my teeth meet makes it difficult	75.5	78.1	13.9	13.9	7.5	6.5	1.5	1.5	2.5	0
I do not like eating in public places	56.5	63.2	22.0	17.9	9.5	11.9	6.0	3.0	6.0	3.5
I get pains in my face or jaw	85.0	81.6	8.0	13.4	4.0	2.5	2.0	1.0	1.0	1.5

**Table 4.** The frequency distribution percentage of participants' responses in social domain

Questions	Never		Few		Somewhat		High		Very high	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
I try to cover my mouth when I meet people for the first time	63.0	77.1	17.0	12.4	10.0	3.5	2.5	4.0	7.5	2.5
I worry about meeting people for the first time	50.5	46.3	26.0	23.4	9.0	17.4	6.5	8.5	8.0	4.5
I worry that people will make harmful comments about my appearance	53.5	43.3	21.0	15.4	9.5	15.4	4.0	6.5	12.0	10.0
I lack confidence when I am out socially	55.5	40.3	23.0	23.4	10.5	19.4	5.0	9.0	9.0	8.0
I do not like smiling when I meet people	65.5	69.2	16.5	18.9	9.5	7.0	2.5	3.0	6.0	2.0
I sometimes get depressed about my appearance	78.5	67.7	11.0	16.9	6.0	8.5	1.0	3.0	3.5	4.0
I sometimes think that people are staring at me	47.0	36.3	33.5	23.9	14.0	20.4	4.0	10.0	1.4	4.0
Comments about my appearance really upset me, even when I know people are only joking	51.5	48.3	22.0	21.9	9.5	13.9	7.0	9.0	10.0	7.0

15.7% of the examined students had an essential need for treatment. The rate was reported to be 44.0% for Canadian children,<sup>9</sup> 24.7% for teenagers in Malaysia,<sup>14</sup> and 27.8% for Turkish students,<sup>20</sup> which is more than the

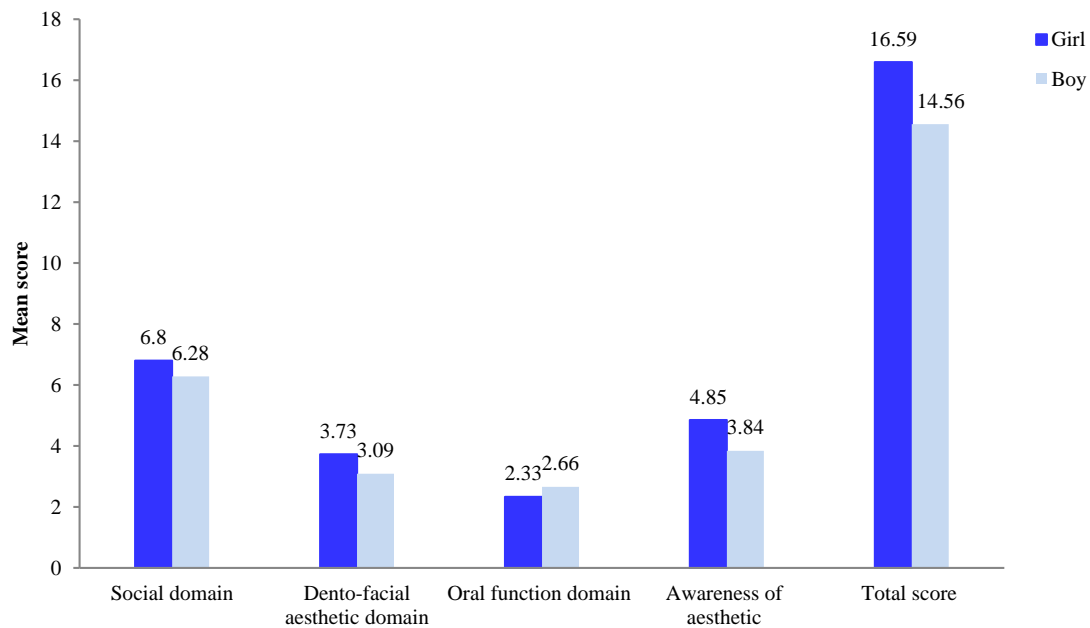
current study.

This rate was 10.3% for Brazilian teens<sup>15</sup> and 9.9% for Spanish teens;<sup>19</sup> the reason for this could be attributed to genetic variations between different populations.

**Table 5.** The correlation between orthodontic quality of life (QOL) and orthodontic treatment need based on gender

Questions		Girls		Boys	
		Mean ± SD		Mean ± SD	
Social domain	Low need	6.48 ± 4.99		5.99 ± 5.81	
	Need	7.00 ± 4.75		6.80 ± 6.71	
	Severe need	7.72 ± 7.40		5.72 ± 5.19	
	Essential need	7.00 ± 6.54		6.39 ± 5.25	
	Total	6.82 ± 5.80		6.24 ± 6.00	
P		0.740		0.768	
Dentofacial aesthetic domain	Low need	3.58 ± 3.38		3.11 ± 2.40	
	Need	4.59 ± 3.72		3.43 ± 2.71	
	Severe need	2.47 ± 2.50		2.74 ± 2.50	
	Essential need	4.15 ± 4.15		2.74 ± 2.57	
	Total	3.74 ± 3.65		3.09 ± 2.55	
P		0.796		0.958	
Oral function domain	Low need	1.82 ± 1.49		2.49 ± 1.82	
	Need	2.44 ± 1.78		3.13 ± 2.07	
	Severe need	2.49 ± 1.87		2.49 ± 1.78	
	Essential need	3.36 ± 2.15		2.14 ± 2.12	
	Total	2.33 ± 1.76		2.67 ± 1.98	
P		0.441		0.932	
Knowledge of dentofacial aesthetic domain	Low need	4.86 ± 3.12		3.73 ± 2.70	
	Need	5.05 ± 3.08		4.16 ± 3.35	
	Severe need	5.23 ± 3.91		3.53 ± 2.88	
	Essential need	3.96 ± 2.90		3.65 ± 2.84	
	Total	4.84 ± 3.25		3.83 ± 3.00	
P		0.404		0.391	
Total score	Low need	15.76 ± 9.38		13.00 ± 10.54	
	Need	16.91 ± 9.46		16.30 ± 14.33	
	Severe need	18.75 ± 16.40		13.50 ± 9.58	
	Essential need	15.81 ± 12.69		14.36 ± 9.40	
	Total	16.59 ± 11.47		14.56 ± 11.76	
P		0.612		0.498	

SD: Standard deviation

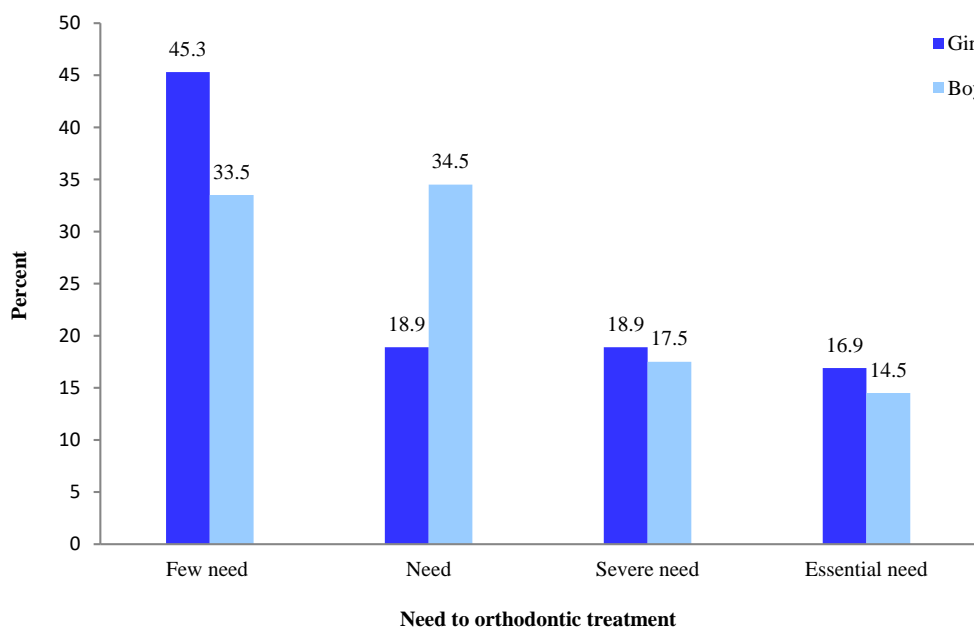


**Figure 1.** The mean score of orthodontic quality of life (QOL) and domains according to gender

In the present study, 26.7% of people had DAI = 26-30. This rate was reported at 19.2% in the studies of Khanehmasjedi et al.,<sup>23</sup> 21.2% in Spain,<sup>19</sup> and 20.3% in South Africa,<sup>24</sup> which almost corresponds to current study.

In the present study, the missing tooth rate was 9.47%, which is more than the study by

Karimi Afshar et al.,<sup>25</sup> who reported the rate as 5.4% and the study by Baca-Garcia et al., who stated the frequency of missing teeth as 3.5% in 14-20-year-old Spanish subjects;<sup>19</sup> the reason for this difference can be attributed to the difference between the type of study and the studied population.



**Figure 2.** The frequency distribution of participant to intensity of orthodontic treatment need according to gender

In the current study, the most common problems in DAI were anterior crowding (43.25%) and molar relationship (62.40%), which is consistent with the study of Uzuner et al.<sup>20</sup> Claudino and Traebert also showed that the incisor crowding and the mandibular incisor irregularities were the most common problems.<sup>26</sup> There was no statistically significant difference between sex and DAI, which is consistent with the study of Khanehmasjedi et al.<sup>23</sup>

In our study, the level of orthodontics-related QOL was high ( $15.60 \pm 11.16$ ), which is consistent with the study of Karimifshar et al.<sup>27</sup> on adolescent girls and the study of Taylor et al.<sup>28</sup>

In questions of the questionnaire, 11.2% of the students gave the answer of "very high" to the question "I spend a lot of time checking my face in mirror". In the study of Karimifshar et al., the same question had the highest answer of "very high" option.<sup>27</sup>

In the present study, there was no statistically significant difference between orthodontics-related QOL and need for orthodontic treatment, inconsistent with the findings of Kunz et al.<sup>10</sup> The reason for this difference is probably the different questionnaires used in this research.

Although the DAI determines the relative social acceptability and functionality of dental appearance, it should take into account ideally the patient's psychological and social perspective.<sup>29,30</sup> Considering the psychosocial view of the patient provides the possibility of assigning a suitable treatment plan to the patient. The patient's consciousness of occlusion may be inconsistent with its severity. Some patients with severe malocclusion are unconcerned about their condition, while minor dental

irregularities may be of great importance in others. Therefore, using an occlusal index alone and regardless of the patient's psychosocial need may be problematic. DAI is the measure taken by the dentist, while the OHRQOL is the patient's own assessment.<sup>14</sup> It has been revealed that malocclusion has a negative effect on QOL and this effect is more pronounced in social and emotional contexts. It has also been documented that the orthodontic treatment has led to the improvement of orthodontics-related QOL.<sup>29</sup>

Different results can be due to the difference in the index used to evaluate malocclusion and different versions of QOL questionnaires. In addition, QOL is affected by personality traits. The clinicians should consider QOL as the compatibility of patients with living conditions instead of their health status based on expert opinion.

Since this study was conducted on Kerman high school students, the results can not be generalized to other communities.

## Conclusion

Based on the findings of the present study, the orthodontics-related QOL was high in first course high school students in Kerman. Additionally, no statistical correlation was reported between DAI and orthodontics-related QOL and corresponding domains.

## Conflict of Interests

Authors have no conflict of interest.

## Acknowledgments

The authors, hereby, would like to thank the Research Deputy of Kerman University of Medical Sciences for approval and financial support of this project and also all of participants for their cooperation.

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