



## Relationship between malocclusion and oral health related quality of life among high school girl students in Ahvaz-Iran

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### Article History

Received: 19 July 2019

Reviewed: 22/July/2019 to 01/September/2019

Accepted: 04 September 2019

Prepared: 10 September 2019

Published: November - December 2019

### Citation

MashallahKhaneh Masjedi, Marzieh Araban, MarziehAhmadi Arpanah. Relationship between malocclusion and oral health related quality of life among high school girl students in Ahvaz-Iran. *Medical Science*, 2019, 23(100), 910-919

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### General Note



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### ABSTRACT

*Introduction:* Malocclusion is a departure from normal aesthetic of the community rather than a disease. It is expected that its treatment can improve oral function and the appearance of the people which can affect the quality of their life. The purpose of this

study was to investigate the relationship between IOTN index-based malocclusion and quality of life related to the oral health using OIDP index in high school girl students in Ahvaz in 2018. *Materials and Methods:* 200 high school students aged 15-18 years old participated in this descriptive-analytical and cross-sectional study. Data were collected using the OIDP and IOTN indexes. Data analysis was performed using spss-20 software at a significance level of 95% ( $p < 0.05$ ). *Conclusion:* Considering the importance of the relationship between AC component and quality of life, it is recommended to consider various social and psychological aspects of oral and dental condition in providing dental services in order to improve the overall quality of life of individuals.

**Keywords:** Quality of Life, Malocclusion, IOTN Index, OIDP Index

## 1. INTRODUCTION

In contemporary orthodontics the number of people who turn to orthodontic treatment to improve psychosocial problems related to the facial appearance has risen throughout the past decades. Even contemporary orthodontics gives more importance to the aesthetic and facial appearance as a treatment goal (Proffit et al., 2018; Shaw et al., 1985). Malocclusion is a departure from normal aesthetic of the community rather than a disease. It is expected that its treatment can improve oral function and the appearance of the people (Asgari et al., 2012; Wędrychowska-Szulc & Syryńska, 2009). Several clinical indexes have been used to determine the need of orthodontic treatment in recent years. Index of Orthodontic Treatment Need (IOTN) is a malocclusion-based scoring system that is widely used to actual assessment and Perceptual needs of orthodontic treatment in researches (Chen et al., 2014). Shaw et al showed that the psychosocial negative effects of an unacceptable appearance could be as much as biological problems or even more than it (Shaw, 1981).

Using only clinical evaluations to examine the needs and health of the mouth has critical constraints because these evaluations are not able to determine the various aspects of perceived needs of examined person about health (Allen et al., 2001). Evaluation of Oral Health Related Quality of Life index (OHRQL) has been developed along clinical examinations to investigate the perceived needs of patients about dental and oral health (John et al., 2004). Oral Health Related Quality of Life index considers the effect of oral conditions on social performance that causes major changes in behavior. Oral Impact on Daily Performance (OIDP) index is one of the important OHRQL indices (Brunelle et al., 1996) that examines the effects of oral health of individuals on their ability to perform daily activities. Persian version of this index investigates 11 items including mental, physical and social dimensions of life (3 to 12 tables) (Shaw, 1981; Brunelle et al., 1996).

The purpose of this study is to investigate the relationship between IOTN index-based malocclusion with the quality of life related to oral health using the OIDP index for high school girl students in Ahvaz in 2017-2018 academic year.

## 2. METHODOLOGY

This descriptive-analytical and cross-sectional study was carried out on 200 high school girl students (15-18 years old) who were selected from Ahvaz schools based on randomized cluster sampling. Selection criteria were the lack of orthodontic treatment in the past or present and the presence of all permanent teeth (except the wisdom tooth) in the mouth. Exit criteria from the sample were the presence of any physical or mental disability in the students.

The structure and goal of the study were explained to the subjects who had met the entire inclusion criteria. The proposal for this study was approved by the Ethics Committee of Ahvaz Jundishapor University of Medical Sciences (ethical committee approval code: IR.AJUMS.REC.1396.355). After signing informed consent by parents and students, samples were examined in a room with adequate light and we tried to ensure that the conditions of the examination environment were the same for all people as far as possible. Mirror, abaisse-langue, disposable gloves and metal ruler for millimeter measuring (with a precision of 0.1 mm) were used for examination.

Two questionnaires were prepared for each student:

*OIDP questionnaire:* Persian version of this index investigates 11 items that covers the psychological, physical and social dimensions of life (Table 3) (Shaw, 1981; Brunelle et al., 1996; Mohebbi et al., 2012). Total score that obtained from various performances (performance score = intensity score  $\times$  frequency score) was divided by the maximum possible score to determine the OIDP index score. In this way different problematic performances in patients, if any, were considered. Minimum frequency and intensity was 1 and more frequency and intensity were given 2, 3, 4 and five respectively. Then these scores were multiplied to 100 and percentages were obtained (Dorri et al., 2007). After giving enough explanation and explaining the questions by the examiner, the questionnaire was completed by the students.

*IOTN questionnaire*: this questionnaire includes two components of dental health component (DHC) and aesthetic components (AC). DHC has 5 grades. Grade 1 and 2 means no or partial need, grade 3 means medium need and grades 4 and 5 means definite need for orthodontic treatment. AC component includes 10 color photographs. Photographs with grades 1, 2, 3 and 4 means no or partial need, grades 5, 6 and 7 means medium need and grades 8, 9 and 10 means definite need for treatment (Hamdan, 2004).

According to DHC, each student was categorized in one of the treatment requirement level. Then ten photos related AC components were given to them and they were asked to select the one which has most similarity with their dental system and the student's opinion was recorded in a special sheet.

Malocclusion status of ten persons which was like research samples were investigated by a researcher and an orthodontist to verify examined person and agreement coefficient was equal to 0.9 Kappa.

Descriptive statistics were used to analyze the data and examining the relationship between the data was done by chi-square and ANOVA tests. Data analysis was done with SPSS-20 software at a significant level of 95% ( $p < 0.05$ ).

### 3. RESULTS

Among 200 studied students 8.5% were 15 years old, 46% were 16 years old, 38.5% were 17 years old and 7% were 18 years old. According to DHC, 80.5% of samples had no or partial need for orthodontic treatment, 3% had medium need and 16.5% had definitive need (table 1).

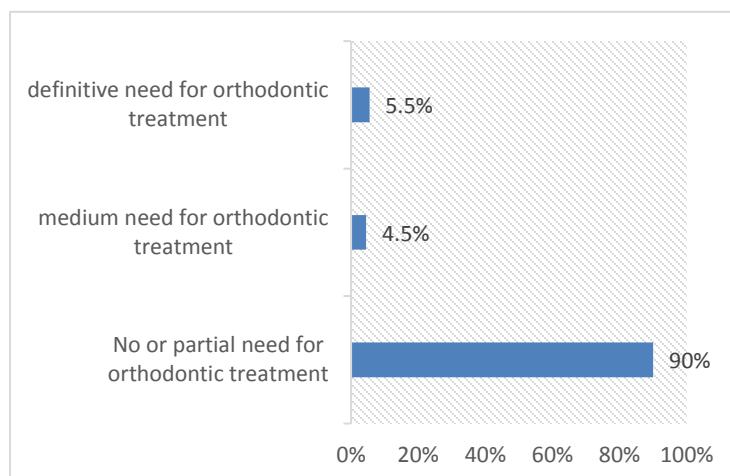
**Table 1** Frequency distribution of students need for orthodontic treatment based on DHC

Occlusion condition	Number	Percentage (%)
No or partial need for orthodontic treatment	161	80.5
medium need for orthodontic treatment	6	3
definitive need for orthodontic treatment	33	16.5
Total	200	100

According to AC component, 90% of students had no or partial need for orthodontic treatment, 4.5% of them had medium need and 5.5% of them had definite need by their opinion (table 2) and figure 1.

**Table 2** Frequency distribution of students need for orthodontic treatment based on AC, according to their own opinion

Occlusion condition	Number	Percentage (%)
No or partial need for orthodontic treatment	180	90
medium need for orthodontic treatment	9	4.5
definitive need for orthodontic treatment	11	5.5
Total	200	100

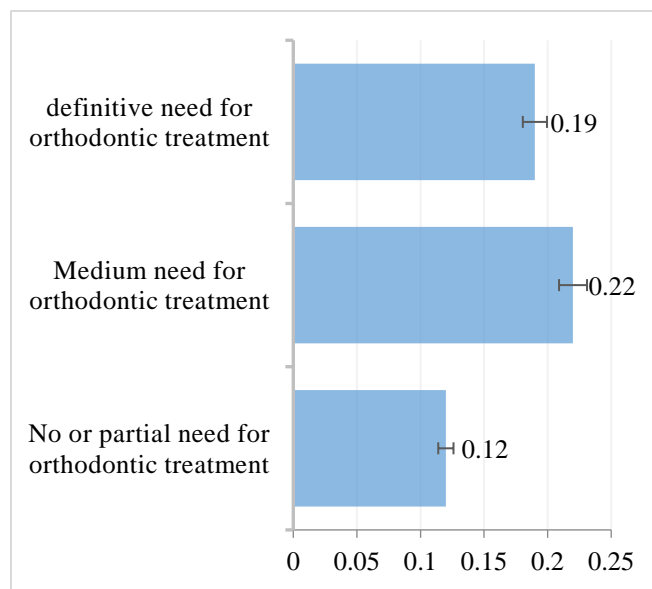


**Figure 1** Frequency distribution of students need for orthodontic treatment based on AC, according to their own opinion

According to the OIDP index most affected oral and dental activities were related to smiling (88%), eating (86%) and emotional conditions (81%), respectively (table 3).

**Table 3** Frequency distribution of oral and dental health effects on daily activities based on OIDP index

Activity	Effect status			
	Yes		No	
	Number	Percentage (%)	Number	Percentage (%)
Eating	172	86	28	14
Speaking	111	55.5	89	44.5
Teeth cleaning	125	62.5	75	37.5
Doing light activities	95	47.5	105	52.5
Going out	96	48	104	52
Sleeping	105	52.5	95	47.5
Resting	98	49	102	51
Smiling	176	88	24	12
Emotional conditions	162	81	38	19
pleasure of social relationships	123	61.5	77	38.5
Work activities	99	49.5	101	50.5



**Figure 2** The relationship between the students' quality of life score mean based on OIDP index and the need for orthodontic treatment according to the DHC component

As the results of Table 4 & figure 2 show, according to DHC component the medium quality of life score in students who had no or partial need for orthodontic treatment was less than other groups, which it means higher level of life satisfaction in these students. According to the results of ANOVA test different level of life quality between groups was not significant ( $P = 0.184$ ). Higher scores mean lower quality of life and satisfaction, and vice versa.

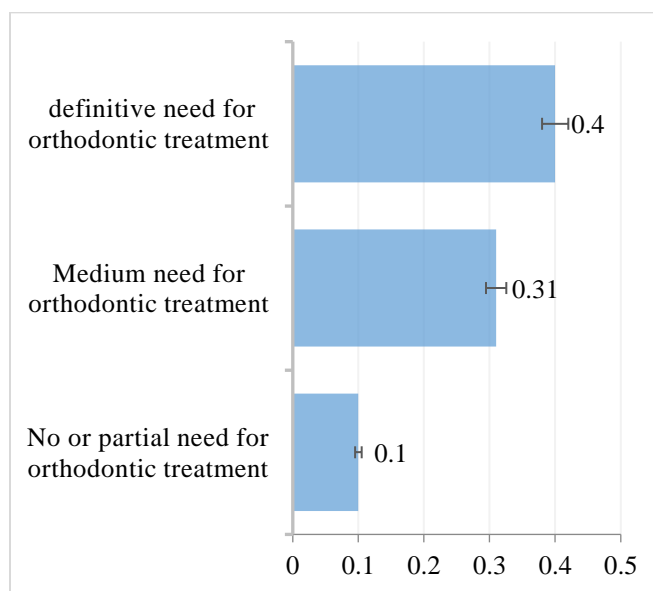
**Table 4** The relationship between the students' quality of life score mean based on OIDP index and the need for orthodontic treatment according to the DHC component

DHC Variable	number	Percentage (%)	Total score of life quality		P-Value
			mean	Standard deviation	
No or partial need for orthodontic treatment	161	80.5	0.12	0.22	0.184
Medium need for orthodontic treatment	6	3	0.22	0.32	
definitive need for orthodontic treatment	33	16.5	0.19	0.29	
Total	200	100	0.18	0.28	

According to the ANOVA results, mean of life quality score in students who had no or partial need for orthodontic treatment based on AC was significantly lower than other groups ( $P = 0.001$ ). This finding suggests that students with no or partial need for orthodontic treatment has more satisfaction in their life (table 5 & figure 3).

**Table 5** The relationship between the students' quality of life score mean based on OIDP index and need for orthodontic treatment based on AC according student's opinion

AC Students Variable	number	Percentage (%)	Total score of life quality		P-Value
			mean	Standard deviation	
No or partial need for orthodontic treatment	180	90	0.10	0.19	0.001
Medium need for orthodontic treatment	9	4.5	0.31	0.47	
definitive need for orthodontic treatment	11	5.5	0.4	0.41	
Total	200	100	0.27	0.36	



**Figure 3** The relationship between the students' quality of life score mean based on OIDP index and need for orthodontic treatment based on AC according student's opinion

Total quality of life mean in the age group of 15 to 18 years old was 0.13. As it is shown in Table 6, quality of life mean in the age group of 17 was higher than other groups that mean less satisfaction with life in this group. The results of ANOVA test showed that there is no significant difference between mean score of quality of life in different age groups ( $P = 0.428$ ).

**Table 6** Comparison of total quality of life score means based on OIDP index in students by different age groups

Age Variable	Age	Number	Total score	Life quality	P value
			mean	Standard deviation	
Age	15	17	0.14	0.29	0.472
	16	92	0.11	0.21	
	17	77	0.16	0.27	
	18	17	0.08	0.12	
	Total sample	200	0.13	0.24	

As it is shown in Table 7, based on DHC component 83% of medium need for treatment and 55% of definite need for treatment belongs to the 16 years old age group. The results of  $X^2$  test showed that there was no significant difference between the occlusion status based on DHC in different age groups ( $P = 0.345$ ).

**Table 7** Comparison of the treatment need in students based on DHC in different age groups

Age variable	No or partial need for Orthodontic treatment		Medium need for orthodontic treatment		definitive need for orthodontic treatment		P value
	number	percentage	number	percentage	number	percentage	
	15 years old	13	8	0	0	4	
16 years old	69	43	5	83	18	55	
17 years old	66	41	1	17	10	30	0.345
18 years old	13	8	0	0	1	3	
Total	161	100	6	100	33	100	

As it is shown in Table 8, based on the AC component 55% of definite need for treatment among students by their own opinion belong to 16 years old group. The results of the  $X^2$  test showed that based on AC component there was no significant difference between Occlusion conditions in different age groups by their own opinion ( $P = 0.640$ ).

**Table 8** Comparison of the need for orthodontic treatment by their own opinion in different age groups based on AC component

Occlusion condition by students opinion based on AC component							
Age variable	No or partial need for Orthodontic treatment		Medium need for orthodontic treatment		definitive need for orthodontic treatment		P value
	number	percentage	number	percentage	number	percentage	
15 years old	17	10	0	0	0	0	
16 years old	83	46	3	33	6	55	
17 years old	67	37	5	56	5	45	0.640
18 years old	13	7	1	11	0	0	
Total	180	100	9	100	11	100	

#### 4. DISCUSSION

As the mouth is the reflection of body health therefore paying attention to oral health has particular importance. Oral health not only affects the health of a person but also can affect the quality of life in all aspects of physical, mental and social health generally. Accordingly paying attention to the oral and dental problems and its relationship with quality of life and daily activity can be considered as an important step towards the introduction of effective factors on quality of life and improving it (Mohebbi et al., 2012). So in this study we tried to review the relationship of life quality and oral health in a sample of high school girl students in Ahwaz to show its relationship with malocclusion.

This study findings showed that based on DHC component in assessing the occlusion status, 80.5% of samples had no or partial need for orthodontic treatment and 16.5% of them had definite need for orthodontic treatment. In a study by Rengiz et al. (2019) in Malaysia, it was found that among 290 participants in 13 to 30 years old group, 7.9% of them had no or partial need for orthodontic treatment, 32.1% of them had medium need for orthodontic treatment and 17.2% of them had definitive need for orthodontic treatment (George et al., 2018). Following a study of 911 students of 11-18 years old in Lithuania Kavalloskin et al (2018) showed that 33.4% of them had definitive need for orthodontic treatment (Zaborskis et al., 2019). Bhardwaj et al. (2011) studied 622 16 and 17 years old Indian students and reported that 20.42% of them needed orthodontic treatment (Bhardwaj et al., 2011). Puertes-Fernandez et al (2010) in Morocco studied 248 12-years old teenagers and found that 18.1% of them needed orthodontic treatment (Puertes-Fernandez et al., 2010). Also Manzanera et al in Spain reported that in 12 years old group 23.5%, and in 15-16 years old group 18.5% had a need for orthodontic treatment (Manzanera et al., 2008).

Khanehmasjedi et al. (2017) studied 192 14-18 years old male high school students in Iran and reported that based on IOTN index 51.1% of them had no or partial need for orthodontic treatment based on the DHC component (Khanehmasjedi et al., 2017). Feyzbakhsh et al. (2013) studied 14-18 years old male students based on IOTN index and found that 4.4% had very severe need, 16.2% had severe need, 22.5% had medium need and 56.9% had no or partial need for treatment (Feyzbakhsh et al., 2013). Findings of these studies have some similarities and differences with our study. Differences may be related to the environmental, racial and such issues between the study samples and their size.

Second component, IOTN, is related to the aesthetic (AC). The results showed that by samples opinion 90% had no or partial need and 5.5% had definite need to the orthodontic treatment. As the current study Khanehmasjedi et al. (2017) found that 90.1% of student by their opinion and based on AC component had no or partial need for orthodontic treatment (Khanehmasjedi et al., 2017). Feyzbakhsh et al. (2013) obtained different statistics for AC component compared to DHC. They found that 76.5% of sample had no or partial need, 15.2% had medium need and 8.3% had definitive need for treatment. This means that their study, like ours, showed that treatment need percentage based on AC is lower than DHC (Feyzbakhsh et al., 2013). These findings are similar to the results of the Kolawole et al. (2009) study in Nigeria which reported that between 11-14 years old students 8% of them had definitive need for treatment based on AC component (Kolawole et al., 2008). Other studies have shown similar results too (Abu Alhaja et al., 2005; Mandall et al., 2000).

Assessment of the life quality of students based on the OIDP questionnaire was another item that was investigated in this study. Findings showed that total mean quality of life score in the samples of this study was 0.13 with a standard deviation of 0.24. The most affected activities were smiling (88%), eating (86%) and emotional condition (81%).

In this regard, various studies have been carried out in Iran and the world that have differences and similarities with our study. For example, Nagarajappa et al. (2017) studied 17 – 24 years old students and found that over six month's duration, 60% of the samples had at least one effect of oral condition on their daily activity. In addition, in this study the mean score and standard deviation of OIDP was 2.49 and 3.92 respectively. Also the most affected activity was tooth cleaning (24%) and eating (12%),

(Nagarajappa et al., 2018). Razanamihaja et al. (2017) showed that approximately 74% of the samples observed the effects of oral condition on their daily activities over a 6 months' time. Also they reported that the most affected activities were smiling, eating, sleeping and resting, respectively (Razanamihaja & Ranivoharilanto, 2017). Usha et al. (2013) in India found that between 12 to 15 years old teenagers 44% of samples experienced at least one oral effect on their daily activities during 6 months. In addition, eating (33%) tooth cleaning (22%), and talking (20%) were the most affected activities and resting and work activities had the least impact (Usha et al., 2013). Bianco et al. (2009) findings showed that in a sample of 11-16 years old students in Italy mouth condition of almost 84.8% of them had an effect on their daily activity (Bianco et al., 2009).

Study of KhanehMasjedi et al. on 192 male high school students aged 14-18 years old showed that the oral and dental condition had a significant effect on life quality on 26.6% of the samples. The most affected activities were smiling (15.6%) and emotional conditions (9.9%). ODP score mean for students was 48/6 (Khanemasjedi et al., 2016). Vaziri et al. (2015) in Yazd showed that mean score of life quality in men was 68.4 and in women was 67.8 but this difference was not statistically significant ( $P = 0.519$ ) (Vaziri et al., 2016). Mohebbi et al. (2012) in Tehran showed that 85.6% of their samples experienced at least one oral effect on daily activity in the 6 months of the study. Also, the most disrupted activity was eating (1/50%), smiling and showing teeth without embarrassment (12.8%). ODP score mean for the population surveyed was 5.6 and its variation range was between 0 and 36 (Mohebbi et al., 2012). In most mentioned studies, samples stated that their oral and teeth condition affected smiling and tooth appearance without embarrassment, which is consistent with the present study. There are also differences in these studies with the present one which may be due to differences in the demographic characteristics of the studied samples, such as age, gender, and different ethnic and cultural status, as well as differences in the tools used in these studies. In addition, the concept of quality of life is one of the concepts that is largely related to the perception of individuals, so individual and social characteristics can affect their perception of this concept. Therefore, another part of the differences between studies can be related to this issue.

The study of the relationship between quality of life and the occlusion status of the samples in this study showed that the quality of life status was not significantly correlated with the occlusion status of the samples based on the dental health index (DHC) ( $p = 0.132$ ). Similarly, Rangiz et al. (2018) found that malocclusion had a negative effect on OHRQOL levels in Malaysia (George et al., 2018). The study of Cavalloscine (2018) in Lithuania showed that malocclusion had a negative impact on youth's OHRQOL, and emotional and social aspects had the most damage (Zaborskis et al., 2019). Khanemasjedi et al. (2017) showed that the status of life quality had no significant correlation with Occlusion condition of male students based on DHC component. But life quality score in people who had medium need for orthodontic treatment based on the AC component, as in other studies, was higher than other groups and this difference was statistically significant (Khanemasjedi et al., 2017). Masood et al. (2013) in Malaysia showed that malocclusion has a significant negative effect on the quality of life related to the oral health and its domains (Masood et al., 2013). Oliveira et al. (2004) and Scapini et al. (2013) in Brazil reported that malocclusion had a negative effect on the quality of life of adolescents. Klages et al. (2004) in the Netherlands showed that slight changes in teeth's beauty and increased consciousness of the patients could have a significant effect on the quality of life associated with oral health (Klages et al., 2004).

Heravi et al. (2011) showed that malocclusion plays an important role in health-related quality of life, however, the relationship between mental health, social health and malocclusion was not significant (Heravi et al., 2011). In this study, the quality of life questionnaire was a modified version of CPQ and ICON index was used to determine Malocclusion. Therefore, some of the differences in this study with our study can be related to the use of various research tools. Sadeghi et al. (2009) showed that the correlation coefficient between the intensity of malocclusion and the quality of life associated with oral health indicated a significant relationship between these two items ( $P < 0.01$ ). But unlike the expectation, people with the most severe malocclusion have an average quality of life associated with oral health, while the lowest levels of quality of life associated with oral health belong to people with moderate malocclusion (Sadeghi et al., 2009) which indicates that there is no direct relationship between the intensity of malocclusion and life satisfaction. The difference in the results of these studies and our study depends on several factors, including the racial and demographic differences of the samples, the tools used to examine each of these variables, the difference in evaluation method, the characteristics of assessors and differences in oral health in different populations, and the different attitudes of people in different cultures about oral and dental problems.

## 5. CONCLUSION

It seems that AC component, which is related to the appearance of people and affects their mental and social conditions, has a greater and more important role in the quality of life. As the relationship between AC component and quality of life is significantly meaningful, considering different aspects of social and psychological status of oral and dental care in dental services is recommended to improve the life quality.



## Acknowledgments

We acknowledge of research deputy of Ahvaz Jundishapur University of Medical Sciences for the financial support.

## Conflict of Interest

The author(s) declared no conflicts of interest.

## Financial resources

The cost of this thesis is provided by validation of the research project with GP-95160 approved number.

## REFERENCE

1. Abu Alhajja ES, Al-Nimri KS, Al-Khateeb SN. Self-perception of malocclusion among north Jordanian school children. *Eur J Orthodont*. 2005; 27(3):292-295.
2. Allen PF, McMillan AS, Locker D. An assessment of sensitivity to change of the Oral Health Impact Profile in a clinical trial. *Community Dent Oral Epidemiol*. 2001; 29(3):175-182.
3. Asgari I, EbnAhmady A, Khoshnevisan MH, Eslamipour F. Evaluation of the patient-based indices for orthodontic need assessment in the 13 to 18 year-old adolescents in Isfahan. *J Dent Med*. 2012; 25(2):124-134.
4. Bhardwaj VK, Veerasha KL, Sharma KR. Prevalence of malocclusion and orthodontic treatment needs among 16 and 17 year-old school-going children in Shimla city, Himachal Pradesh. *Indian J Dent Res*. 2011; 22(4):556-562.
5. Bianco A, Fortunato L, Nobile CG, Pavia M. Prevalence and determinants of oral impacts on daily performance: results from a survey among school children in Italy. *Eur. J. Public Health*. 2009; 20(5):595-600.
6. Brunelle JA, Bhat M, Lipton JA. Prevalence and distribution of selected occlusal characteristics in the US population, 1988–1991. *J Dent Res*. 1996; 75(2\_suppl):706-713.
7. Chen M, Feng ZC, Liu X, Li ZM, Cai B, Wang DW. Impact of malocclusion on oral health-related quality of life in young adults. *ANGLE ORTHOD*. 2014; 85(6):986-991.
8. De Oliveira CM, Sheiham A. Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *J. Orthod*. 2004; 31(1):20-27.
9. Dorri M, Sheiham A, Tsakos G. Validation of a Persian version of the OIDP index. *BMC oral health*. 2007; 7(1):2-10.
10. Feyzbakhsh M, Khadem P, Sarandi S, Teimouri F, Aslani F, Dadgar S. Orthodontic Treatment Needs of 14-18 Year-Old Male Students of Isfahan in 2009-2010 Using IOTN Index. *J Mashhad Dent Sch*. 2013; 37(2):145-152.
11. George R, Samson RS, Soe HH, Donald PM, Hui WL, Ling PK, Saseendran K. Oral health-related quality of life and the index of orthodontic treatment need to evaluate the association of patients' self-perceived need and normative need toward orthodontic treatment. *J Int Oral Health*. 2018; 10(3):115-123.
12. Hamdan AM. The relationship between patient, parent and clinician perceived need and normative orthodontic treatment need. *EUR J ORTHODONT*. 2004; 26(3):265-271.
13. Heravi F, Farzanegan F, Tabatabaee M, Sadeghi M. Do malocclusions affect the oral health-related quality of life?. *ORAL HLTH PREV DENT*. 2011; 9(3):65-73.
14. John MT, Koepsell TD, Hujoel P, Miglioretti DL, LeResche L, Micheelis W. Demographic factors, denture status and oral health-related quality of life. *Community Dent Oral Epidemiol*. 2004; 32(2):125-132.
15. Khanemasjedi M, Araban M, Mohomadina M, Relationship between malocclusion and oral health - related quality of life among high school - children of Ahvaz in 2016 journal of Education and community health, Hamedan University of Medical science; 2017.
16. Klages U, Bruckner A, Zentner A. Dental aesthetics, self-awareness, and oral health-related quality of life in young adults. *EUR J ORTHODONT*. 2004; 26(5):507-514.
17. Kolawole KA, Otuyemi OD, Jeboda SO, Umweni AA. Awareness of malocclusion and desire for orthodontic treatment in 11 to 14 year-old Nigerian schoolchildren and their parents. *AustOrthod J*. 2008; 24(1):21-29.
18. Mandall NA, McCord JF, Blinkhorn AS, Worthington HV, O'Brien KD. Perceived aesthetic impact of malocclusion and oral self-perceptions in 14-15-year-old Asian and Caucasian children in greater Manchester. *EUR J ORTHODONT*. 2000; 22(2):175-183.
19. Manzanera D, Montiel-Company JM, Almerich-Silla JM, Gandía JL. Orthodontic treatment need in Spanish schoolchildren: an epidemiological study using the Index of Orthodontic Treatment Need. *EUR J ORTHODONT*. 2008; 31(2):180-183.
20. Masood Y, Masood M, Zainul NN, Araby NB, Hussain SF, Newton T. Impact of malocclusion on oral health related quality of life in young people. *Health Qual Life Out*. 2013; 11(1):25-37.
21. Mohebbi S, Sheikhzadeh S, Bayanzadeh M, Batebizadeh A. Oral impact on daily performance (OIDP) index in patients attending patients clinic at dentistry school of Tehran

- university of medical sciences. *J Dent Med.* 2012; 25(2):135-141.
22. Nagarajappa R, Batra M, Sanadhya S, Daryani H, Ramesh G. Oral impacts on daily performance: Validity, reliability and prevalence estimates among Indian adolescents. *Int J Dent Hyg.* 2018; 16(2):279-285.
  23. Proffit WR, Fields HW, Larson B, Sarver DM. Contemporary orthodontics-e-book. Elsevier Health Sciences; 2018.
  24. Puertes-Fernández N, Montiel-Company JM, Almerich-Silla JM, Manzanera D. Orthodontic treatment need in a 12-year-old population in the Western Sahara. *EUR J ORTHODONT.* 2010; 33(4):377-380.
  25. Razanamihaja N, Ranivoharilanto E. Assessing the validity and reliability of the Malagasy version of Oral Impacts on Daily Performance (OIDP): a cross-sectional study. *Biopsychosoc. Med.* 2017; 11(1):2-9.
  26. Sadeghi M., H.F., Farzanegan F. The study of relationship between the characteristics of occlusion and quality of life associated with oral health in male adolescents in Mashhad high schools. Congress of Specialized Dental Assistants of Iran. 2009; 88-93.
  27. Scapini A, Feldens CA, Ardenghi TM, Kramer PF. Malocclusion impacts adolescents' oral health-related quality of life. *Angle Orthod.* 2012; 83(3):512-518.
  28. Shaw WC, Rees G, Dawe M, Charles CR. The influence of dentofacial appearance on the social attractiveness of young adults. *AM J ORTHOD.* 1985; 87(1):21-26.
  29. Shaw WC. The influence of children's dentofacial appearance on their social attractiveness as judged by peers and lay adults. *AM J ORTHOD.* 1981; 79(4):399-415.
  30. Usha GV, Thippeswamy HM, Nagesh L. Comparative assessment of validity and reliability of the Oral Impacts on Daily Performance (OIDP) frequency scale: a cross-sectional survey among adolescents in Davanagere city, Karnataka, India. *Int J Dent Hyg.* 2013; 11(1):28-34.
  31. Vaziri F, Haerian A, Morowati MA, Amirian E, Gholamin P. Oral health-related quality of life and severity of periodontal disease. *J Int Oral Health.* 2016; 8(4):440-449.
  32. Wędrychowska-Szulc B, Syryńska M. Patient and parent motivation for orthodontic treatment—a questionnaire studies. *EUR J ORTHODONT.* 2009; 32(4):447-452.
  33. Zaborskis A, Kavaliauskienė A, Šidlauskas A. Family Affluence Based Inequality in Oral Health-Related Quality of Life in a Population of Lithuanian Adolescents. *Int J Env Res Pub Health.* 2019; 16(12):1-14.