

# Condition-Specific Oral Health-Related Quality of Life (CS-OHRQoL) measures in Orthodontics- A Narrative Review

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## ABSTRACT

Outcomes pertaining to orthodontics can be either a 'disease' outcome or a 'treatment' outcome. The scales used for outcome assessment are usually the same for both and can be classified as generic or condition specific. Generic scales are used in general for a variety of clinical conditions in dentistry, whereas condition-specific scales are used for specific problems like malocclusion. Due to the peculiar nature of orthodontic problems that do not fall into the definition of a disease, generic scales are of little use and condition-specific scales are recommended. The present article aims to provide a review of the available condition-specific patient-reported outcome measures in orthodontics and perform a critical analysis of the same. A total of nine condition-specific measures were found in the orthodontic literature. Of these, three scales apply exclusively to orthognathic surgical patients. The Psychosocial Impact of Dental Aesthetics Questionnaire and the Malocclusion Impact Questionnaire were found to be the most widely translated and used scales. The robustness of the available condition-specific scales in orthodontics is provided. The selection of one among them is largely the clinician's choice.

**KEYWORDS:** Condition-Specific, Malocclusion Impact Questionnaire, Oral Health Related Quality of Life, Psychosocial Impact of Dental Aesthetic Questionnaire

## BACKGROUND

There has been an upsurge in orthodontic publications after the 2000s related to patient perceptions and changes in perceptions during and after orthodontic treatment. The first attempt to capture patient perceptions was with the introduction of the Aesthetic Component of the Index of Orthodontic Treatment Needs.<sup>1</sup> Multi-item questionnaires to record this intangible dimension of oral health became popular only in recent years. A measure of that nature directly obtained from patients is called Patient-Reported Outcome Measures (PROMs). The impact due to malocclusion was the target of studies with the psychometric scales initially. However, the change in perceptions during or after orthodontic treatment and with various kinds of treatment have been reported recently.<sup>2</sup> All such patient-reported perceptions either due to malocclusion or the impact of orthodontic appliances or treatment have been referred to as the Oral Health-Related Quality of Life (OHRQoL) assessment. In the strict sense, this is however not true because the

orthodontic appliance-related perceptions are usually transient, whereas an OHRQoL measure is intended to assess a more stable construct.

The Condition-Specific (CS) scales are ideally used to detect these impacts.<sup>3</sup> Generic scales used for a variety of conditions are not recommended for specific problems like malocclusions. Moreover, malocclusion does not fall within the boundaries of disease and can be considered only as an anomaly requiring elective treatment.<sup>4</sup> Any such scale should be reliable, valid and responsive, i.e. it should detect changes in conditions with time, for meaningful clinical use. Several criteria are available to identify if the scale is appropriate for a situation or not;<sup>3,5</sup> however selection of the apt scale among the plethora of available ones is still an individual choice.

This review analyses various CS scales in orthodontics and their usefulness in clinical scenarios. A thorough review regarding the use of PROMs in Orthodontics

outlining the available generic scales has been published previously.<sup>6</sup> This can be considered as an extension to it, summarizing and critically analysing the CS psychometric scales.

## METHODS

A thorough electronic literature search was performed in Google Scholar, MEDLINE (via PubMed), Scopus, and Web of Science in June 2022 and later updated until December 16, 2022. A total of 1267 articles were retrieved, out of which 27 publications qualified for full-text review. A total of nine CS scales (Table 1) were available in the orthodontic literature, which are summarized and critically appraised here.

**Table 1: Condition-Specific Patient-Reported Outcome Measures (CS-PROMs) in Orthodontics**

Scale	Authors and year of development	Number of items
Oral Aesthetic Subjective Impact Scale	Mandall et al. 2000	5
Orthognathic QoL Questionnaire	Cunningham et al. 2000	22
Psychosocial Impact of Dental Aesthetic Questionnaire	Klages et al. 2006	23
Surgical Orthodontic Outcome Questionnaire	Locker D et al. 2007	33
Malocclusion Impact Questionnaire	Benson PE et al. 2016	17
Demand for orthodontic treatment questionnaire	Bayat JT et al. 2016	70
Malocclusion Related Quality of Life Questionnaire	Peter E et al. 2019	20
Orthodontic Treatment Satisfaction Questionnaire	Phillips C. 1999	38
Orthodontic Treatment Impact Questionnaire	Kettle J et al. 2020	21

### Condition-specific Measures in Orthodontics

#### 1. Oral Aesthetic Subjective Impact Scale (OASIS)

This was the earliest CS measure to assess malocclusion and was introduced by Mandall et al.<sup>7</sup> The scale includes five items on the appearance of the teeth and the concerns related to it. Each item is graded

on a 7-point scale from “not at all” to “all the time”. A high OASIS score is associated with a poor OHRQoL and indicates a definite need for orthodontic treatment. However, further use of this scale was limited.

#### 2. Orthognathic Quality of Life Questionnaire (OQLQ)

Patients with severe dentofacial deformities may require a combined orthodontic and surgical approach to correct them. There is sound scientific evidence that such deformities can have a negative impact on patients' Quality of Life (QoL).<sup>8</sup> Cunningham et al.<sup>9,10</sup> developed the OQLQ to measure the QoL in such patients, which was validated with favourable outcomes concerning reliability and internal consistency. This is the first widely used CS scale that assesses the subjective impact of specific orthodontic/ orthognathic problems in adults with dentofacial problems. The criteria of Guyatt et al.<sup>11</sup> and Juniper et al.<sup>12</sup> have been followed in its development.

The questionnaire was drafted in English with 22 items divided into four components. Items 1, 7, 10, 11 and 14 are included under one component which expresses concerns about facial aesthetics, items 2–6 on oral function, items 8, 9, 12 and 13 regarding awareness about facial deformities, and items 15–22 are concerned with the social aspects of deformities.

The response to each item is rated using a four-point scale to quantify the extent to which the problem affects the patient (1 = ‘bothers you a little’, 4 = ‘bothers you a lot’) and N/A when the statement does not apply to the patient. A higher score is indicative of poorer QoL and vice-versa. OQLQ is successful in assessing the QoL of patients with dentofacial deformities as well as measuring the impact of orthognathic treatment procedures; leading to its widespread use. The questionnaire has been translated and validated in various languages such as Arabic, Brazilian, Brazilian Portuguese, German, Farsi, Serbian and Spanish. The validity of the scale has been established in cross-sectional and longitudinal studies.

#### 3. Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ)

PIDAQ was developed by Klages<sup>13</sup> to assess the psychosocial impacts of dental aesthetics on OHRQoL. It was initially drafted in German but later translated and published in English for its use worldwide. PIDAQ has 23 items under four domains, namely, the Dental

Self-Confidence (DSC) domain (6 items), Social Impact (SI) with 8 items, Psychological Impact (PI) domain (6 items), and the Aesthetic Concern (AC) with 3 items. The SI and AC consist of revised items of OQLQ. DSC domain was based on their previous research and PI was newly developed. The uniqueness of the scale is the incorporation of the DSC, which measures the positive aspects of dental occlusion. It is suggested that OHRQoL measures should include questions on well-being and not only the detrimental effects of oral conditions. The tool was later adapted for younger adolescents and translated and validated in various languages.

#### 4. Surgical Orthodontic Outcome Questionnaire (SOOQ)

This is another CS instrument developed to provide a comprehensive evaluation of OHRQoL of patients with dentofacial deformities, both pre-and post-surgically.<sup>14</sup> The questionnaire was developed to reflect the impact of these deformities on their QoL, their motivation to undergo surgery, and the impact of such treatment procedures on their social and psychological well-being. SOOQ contains 33 items under five domains, namely, function 1 – issues before surgery (six items); function 2 – issues after surgery (nine items), dental aesthetics (five items), facial aesthetics (four items), and emotional and social well-being (nine items). Each item is drafted in two parts: the first part asks, “How frequently a given problem has been experienced” and, for those reporting “yes”, a second question concerning its importance. The questions regarding ‘frequency’ are rated using a 4-point scale: 0- never; 1- sometimes; 2- ‘often’ and 3- ‘all the time’ and those regarding ‘bother’ are rated as 0- ‘not at all’, 1- ‘a little’, 2- ‘quite a bit’ and 3- ‘very much’.

#### 5. Malocclusion Impact Questionnaire (MIQ)

MIQ was developed to measure OHRQoL in young adults with malocclusion. This helps clinicians and healthcare workers to understand the impact of malocclusion and its associated treatment on individuals. Patel et al.<sup>15</sup> conducted the initial qualitative steps for the development of MIQ and identified three themes. This was based on how the arrangement and appearance of teeth affect their day-to-day life. The items identified were tested cross-sectionally by Benson et al.<sup>16</sup> who found the questionnaire to be valid and reliable. However, further studies are required to confirm the ability of MIQ to sense changes over time (responsiveness).

The questionnaire consists of 17 items and 2 global questions broadly divided into three sections namely: the appearance of teeth, effect on social interactions, and oral health and function. The response format includes a 3-point severity scale (0- ‘don’t’ or ‘doesn’t’, 1- ‘a bit’, 2- ‘very or a lot’). The total raw score can range from 0 to 34 obtained by summing up the individual item scores. The raw score is then transformed to its corresponding interval score, which is provided.<sup>15,16</sup> The scores for the global questions are presented separately.

A recent report has shown that the scale is valid for the New Zealand population.<sup>17</sup> The scale exhibited excellent internal consistency, good construct and criterion validities. Also, MIQ was found to perform similarly in the sample population as in the original study, although the New Zealand adults were found to be less concerned about their aesthetics than the latter. Different regional versions of MIQ are currently available.

#### 6. Demand for orthodontic treatment questionnaire (DOTQ)

The DOTQ was developed by Bayat et al.<sup>18</sup> to identify major factors in predicting the need for orthodontic treatment. The questionnaire contains ten measures under three headings, namely, Psychological and social, Malocclusion-related, and Treatment demand. Each measure, in turn, includes specific numbers of items. The response to each item is rated on a five-point Likert-type scale ranging from 0 – ‘do not agree at all’ to 4 – ‘agree fully’. However, the scale needs further study to establish its reliability and validity.

#### 7. Malocclusion Related Quality of Life Questionnaire (MRQoLQ)

This was developed based on a modified Wilson and Cleary conceptual model taking environmental factors also into consideration. The socio-economic status of individuals is considered important for patients with malocclusion. However, none of the scales mentioned above has incorporated this aspect. MRQoLQ was developed using certain modified items from the available existing scales<sup>13</sup> and some new items based on the qualitative item generation process.<sup>19</sup> There are 20 items arranged in four domains. The first domain is the Psychological Impact (PI) with 6 items and a sub-domain with two items on the socio-economic aspect. The second domain is named Orthodontic Self-Confidence (OSC), containing five modified items of the DSC sub-scale of PIDAQ. The third one is the

Social Impact (SI) with three questions and the last is the Functional Impact (FI) domain containing four questions.

In addition, MRQoLQ has a single-item Global Question (GQ) which also taps the overall QoL related to the position and arrangement of teeth in the same way as in the multi-item scale. This GQ helps in assessing the convergent validity of the scale when used in research which otherwise needs the administration of another similar questionnaire to assess the same. The initial reliability and validity of the scale have been established. However, further validity and responsiveness are yet to be reported.

### 8. Orthodontic Treatment Satisfaction Questionnaire (OTSQ)

Patient satisfaction following orthognathic surgery was assessed using a 38-item questionnaire termed Orthodontic Treatment Satisfaction Questionnaire.<sup>20</sup> Subsequently, 20 questions were added to allow its use among other orthodontic patients and the modified scale was psychometrically assessed among the Dutch population.<sup>21</sup> The 58-item questionnaire was divided into six sub-scales. It was later validated for use among UK adolescents, aged 12 to 15 years, following orthodontic treatment, wherein the number of items was reduced to 37.<sup>22</sup> The revised 37-item questionnaire was found to exhibit satisfactory content validity; however, the test-retest reliability was reported to be poor.<sup>22</sup>

### 9. Orthodontic Treatment Impact Questionnaire (OTIQ)

This is the most recent questionnaire developed to discover how different orthodontic appliances including removable functional, fixed appliances, as well as retainers affect the everyday lives of young patients aged 11 to 17 years.<sup>23</sup> The initial questionnaire with 31 items was later tested and modified using the item-response theory.<sup>24</sup>

The modified version contains 21 items scored on a scale of 0 to 4 along with one global question graded on a 5-point Likert scale.<sup>24</sup> Higher scores indicate more negative impacts.<sup>24</sup> The overall raw score is obtained by summing up the individual item scores. The raw score should then be converted to its corresponding interval score, which is provided.<sup>24</sup> The modified 21-item questionnaire demonstrated good validity and

reliability.<sup>24</sup> Nevertheless, further testing is required to assess the generalizability and responsiveness.

### Critical Analysis of the CS-Psychometric tools in Orthodontics

There are conflicting opinions regarding the use of condition-specific measures in health status assessment. This is because of the multidimensional construct involved in the QoL or psychosocial element of health. The view in favour states that such measures are of more value as they directs questions specifically related to the problem and focus precisely on the impact and perception due to the condition under study. However, the opposing view is equally strong, holding the point that generic scales are broader and catch the dimensions from a wider perspective. Hence, a combination of generic and condition-specific scales is often recommended to negate the shortcomings of using only one of them. However, the drawback is burdening the patients by administering multiple questionnaires.

There are a few criteria by which the robustness of the HRQoL measure can be assessed: one is the criteria of Gill and Feinstein<sup>5</sup> and another by Guyatt and Cook.<sup>11</sup> Locker and Allen<sup>3</sup> developed a seven-point checklist based on Guyatt and Cook's method by which a scale can be assessed. They include:

- 1) Statement of the aim of the measure
- 2) Identification of the domains
- 3) Use of the measure – for surveys or clinical practice
- 4) Items derived based on qualitative inquiry from the respondents
- 5) Relevance of the items
- 6) Inclusion of global rating scales
- 7) Method of validation of the scale

Analysis of the CS-PROMs based on the criteria of the Locker and Allen checklist is presented in Table 2. However, in addition to the above criteria, the responsiveness of the scale should be assessed to ensure that the scale can be used to assess the OHRQoL change following orthodontic treatment. A mix of appropriate condition-specific scales supplemented with suitable generic scales may be considered if one sets out to study the OHRQoL among orthodontic patients.

**Table 2 – Checklist analysis of CS-PROMs in Orthodontics**

Criteria	OASIS	OQLQ	PIDAQ	SOOQ	MIQ	DOTQ	MRQoLQ	OTSQ	OTIQ
Statement of the aim of the measure	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Identification of domains	No	Yes	Yes	Yes	Yes	Unclear	Yes	No	No
Use of the measure	Survey and patient care	Survey and patient care	Survey and patient care	Survey and patient care	Survey and patient care	Unclear	Survey and patient care	Survey and patient care	Survey and patient care
Qualitative steps in item development	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Relevance of the items	Relevant	Relevant	Relevant	Relevant	Relevant	Relevant	Relevant	Unclear	Relevant
Global rating scales	No	No	No	No	Yes - Two questions	No	Yes-One question	No	Yes-One question
Validation method used	Unclear	Normative and Criterion	Normative and Criterion	Discriminant and Construct	Normative	Predictive validity and Factor analysis	Discriminant, Convergent, and Factor analysis	Unclear	Construct

**DISCUSSION**

Traditional means of outcome assessments have undergone a rapid transformation after the acceptance of the World Health Organization’s (WHO) biopsychosocial model of health care in the medical field. Subsequently, it was accepted in the dental field and orthodontics is no exception.<sup>3</sup> Interestingly, orthodontics is one speciality where PROMs are widely used. This is because most orthodontic problems have psychosocial and aesthetic impacts.<sup>25</sup> Hence, there is a need for OHRQoL assessment related to malocclusion and appliance use.

Malocclusion, being a condition-specific problem having impacts mainly in psychological, social and socio-economical domains, is different from other oral conditions that inflict pain, discomfort and dysfunction.<sup>26</sup> For these reasons, condition-specific OHRQoL measures are recommended to assess the impacts of malocclusion. There is also a need to assess the impacts associated with appliance use as well as the change in OHRQoL after treatment.<sup>2</sup> The former is an assessment of appliance-induced discomfort, which is temporary and is not a real assessment of OHRQoL. The latter is termed as assessment of the responsiveness of a scale.<sup>27</sup> With the use of various forms of appliances like removable, fixed, clear aligners, temporary anchorage devices and so on, it is also

pertinent to assess the short-term impact due to these appliances. When PROMs are used in clinical trials as an outcome assessment tool, the reports enable clinicians to take an informed and evidence-based choice of appliance for their patients.

This review aimed to identify, summarise, and critically appraise the various condition-specific OHRQoL measures in orthodontics. The most widely translated and used condition-specific scales currently available in the orthodontic literature are PIDAQ and MIQ. PIDAQ is available in Brazilian, Croatian, Chinese, French, Spanish, Nepalese, Moroccan Arabic, Italian, Turkish, Malay, Malaysian, English, Hindi, and Malayalam.<sup>28</sup> A prospective evaluation of the psychosocial changes following one year after orthodontic treatment was carried out in the Indian population using the Hindi version of PIDAQ.<sup>29</sup> It was found that the scale was able to capture the changes in the psychosocial impact following the treatment of malocclusion.<sup>29</sup>

The English version of MIQ, when tested in the UK<sup>16</sup>, New Zealand<sup>17</sup>, and Nigerian<sup>30</sup> populations, was found to be valid and reliable. The Chinese<sup>31</sup>, Moroccan Arabic,<sup>32</sup> Spanish,<sup>33</sup> Serbian,<sup>34</sup> and Arabic<sup>35</sup> versions of MIQ are currently available. The responsiveness testing of MIQ is currently ongoing.

The aforementioned seven-point checklist enables one to identify and grade a CS-PROM and choose one appropriately. A scale including 70 items as in DOTQ is cumbersome to use in clinical orthodontic research.<sup>18</sup> It should be noted that OHRQoL studies mostly require the administration of multiple questionnaires, leading to participant fatigue and response bias.

It could be noted that most developers of the scales stop with the establishment of their validity and reliability. The assessment of responsiveness, that is, the change in OHRQoL over time is equally important and it adds to the construct validation of the scale. Hence, further studies involving cross-cultural adaptation and its validation, and responsiveness assessment are essential in grading the usefulness of condition-specific scales in orthodontics.

## CONCLUSION

Malocclusion, being an anomaly, calls for elective treatment and does not fit into the criteria of a disease. However, according to the WHO, the treatment for

anomalies can be justified if they cause psychological or emotional problems leading to a social concern. Since malocclusion fulfils this criterion, the treatment though elective is justified. The subjective nature of treatment and disparity in reported treatment needs call for an outcome assessment subjective to patients rather than the clinician. Condition-specific outcome measures are valuable in this regard. An overview and critical appraisal of the available scales specific to malocclusion have been presented. The choice of the scale after translation, validation and cross-cultural adaptation is an individual clinician's preference.

## Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.



## REFERENCES

1. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod.* 1989;11:309-320.
2. Zhang M, McGrath C, Hägg U. Changes in oral health-related quality of life during fixed orthodontic appliance therapy. *Am J Orthod Dentofacial Orthop.* 2008;133(1):25-29.
3. Locker D, Allen F. What do measures of 'oral health-related quality of life' measure? *Community Dent Oral Epidemiol.* 2007;35(6):401-411.
4. Shaw WC, Richmond S, Kenealy PM, Kingdon A, Worthington H. A 20-year cohort study of health gain from orthodontic treatment: Psychological outcome. *Am J Orthod Dentofacial Orthop.* 2007;132(2):146-157.
5. Gill T, Feinstein AR. A Critical Appraisal of the Quality-of-Life Measurements. *JAMA.* 1994;272:619-626.
6. Peter E, Baiju R M, Varughese J and Varghese N. Patient-reported outcome measures in orthodontics. *Dent Med Res.* 2019;7(1)3.
7. Mandall N, F McCord J, Blinkhorn A, Worthington H, O'Brien K. Perceived aesthetic impact of malocclusion and oral self-perceptions in 14-15-year-old Asian and Caucasian children in Greater Manchester. *Eur J Orthod.* 2000;22:175-183.
8. Cunningham SJ, Hunt NP, Feinmann C. Perceptions of outcome following orthognathic surgery. *Br J Oral Maxillofac Surg.* 1996;34(3):210-213.
9. Cunningham S, M Garratt A, Hunt N. Development of a condition-specific quality of life measure for patients with dentofacial deformity. I. Reliability of the instrument. *Community Dent Oral Epidemiol.* 2000;28:195-201.
10. Cunningham S, M Garratt A, Hunt N. Development of a condition-specific quality of life measure for patients with dentofacial deformity. II. Validity and responsiveness testing. *Community Dent Oral Epidemiol.* 2002;30:81-90.
11. Guyatt G, Berman L, Townsend M, Pugsley S, Chambers L. A Measure of Quality of Life for Clinical Trials in Chronic Lung Disease. *Thorax.* 1987;42:773-778.
12. Herdman M, Fox-Rushby J, Badia X. A model of equivalence in the cultural adaptation of HRQoL instruments: the universalist approach. *Qual Life Res.* 1998;7(4):323-35.
13. Klages U. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. *Eur J Orthod.* 2006;28(2):103-111.
14. Locker D, Berka E, Jokovic A, Tompson B. Does self-weighting of items enhance the performance of an oral health-related quality of life questionnaire? *Community Dent Oral Epidemiol.* 2007;35:35-43.
15. Patel N, J Hodges S, Hall M, Benson P, Marshman Z, Cunningham S. Development of the Malocclusion Impact Questionnaire (MIQ) to measure the oral health-related quality of life of young people with malocclusion: part 1 - qualitative inquiry. *J Orthod.* 2016;43(1):7-13.

16. Benson PE, Cunningham SJ, Shah N, et al. Development of the Malocclusion Impact Questionnaire (MIQ) to measure the oral health-related quality of life of young people with malocclusion: part 2 – cross-sectional validation. *J Orthod.* 2016;43(1):14-23.
17. Benson PE, Gilchrist F, Farella M. The Malocclusion Impact Questionnaire (MIQ): Cross-Sectional Validation in a Group of Young People Seeking Orthodontic Treatment in New Zealand. *J. Dent J (Basel).* 2019;7(1):24.
18. Taghavi Bayat J, Huggare J, Mohlin B, Akrami N. Predicting orthodontic treatment need: Reliability and validity of the Demand for Orthodontic Treatment Questionnaire. *Eur J Orthod.* 2017;39(3):326-333.
19. Peter E, Baiju RM, Shivaraman R, Varghese N, Varughese J. Malocclusion-Related Quality of Life Questionnaire (MRQoLQ): Development and validation of a new psychometric tool for older adolescents with malocclusion. *Dental Press J Orthod.* 2019;24:28-35.
20. Phillips C. Patient-Centered Outcomes in Surgical and Orthodontic Treatment. *Semin Orthod.* 1999;5:223-230.
21. Bos A, Hoogstraten J, Prah-Andersen B. Expectations of treatment and satisfaction with dentofacial appearance in orthodontic patients. *Am J Orthod Dentofacial Orthop.* 2003;123:127-132.
22. Tidbury K, Sayers M, Andiappan M, Newton J. Psychometric validation of a pre-existing questionnaire used to measure patient satisfaction following orthodontic treatment in a UK population. *J Orthod.* 2021;48(3):231-240.
23. Kettle J, Hyde A, Frawley T, Granger C, Longstaff S, Benson P. Managing orthodontic appliances in everyday life: A qualitative study of young people's experiences with removable functional appliances, fixed appliances and retainers. *J Orthod.* 2020;47(1):47-54.
24. Benson PE, Alshawy E, Kettle JE, Gilchrist F. Development of the Orthodontic Treatment Impact Questionnaire: Cross-sectional validation. *Am J Orthod Dentofacial Orthop.* 2022;162:e183-e191.
25. Zhang M, McGrath C, Hägg U. The impact of malocclusion and its treatment on quality of life: a literature review. *Int J Paediatr Dent.* 2006;16(6):381-7.
26. Locker D. Oral health and quality of life. *Oral Health Prev Dent.* 2004;2 Suppl 1:247-53.
27. Locker D, Jokovic A, Clarke M. Assessing the responsiveness of measures of oral health-related quality of life. *Community Dent Oral Epidemiol.* 2004;32:10-18.
28. Monisha J, Peter E, Ani GS. Is Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) Valid for the Indian Population?-A Psychometric Study. *J Int Soc Prev Community Dent.* 2021;11(2):207-215.
29. Garg K, Tripathi T, Rai P, Sharma N, Kanase A. Prospective Evaluation of Psychosocial Impact after One Year of Orthodontic Treatment Using PIDAQ Adapted for Indian Population. *J Clin Diagn Res.* 2017;11(8):ZC44-ZC48.
30. Kolawole KA, Ayodele-Oja MM. Oral health-related quality of life of adolescents assessed with the Malocclusion Impact and Child Perceptions questionnaires. *Am J Orthod Dentofacial Orthop.* 2021;159:e149-e156.
31. Li MY, He SL, Wang JH. Validation of the Chinese version of the Malocclusion Impact Questionnaire (MIQ). *Clin Oral Investig.* 2021;25(4):2419-2427.
32. Bourzgui F, Diouny S, Mkhantar H, Serhier Z, Bennani Othmani M. Cross-Cultural Adaptation and Validation of "Malocclusion Impact Questionnaire" into Moroccan Arabic. *Int J Dent.* 2020;2020:8854922.
33. Hope B, Zaror C, Sandoval P, Garay M, Streiner DL. Cross-cultural adaptation and validation in spanish of the malocclusion impact questionnaire (MIQ). *Health Qual Life Outcomes.* 2020;18(1):146.
34. Vucic L, Juloski J, Stefanovic N, Pajevic T, Glišić B. Validation of the translated and cross-culturally adapted Malocclusion Impact Questionnaire in young people seeking orthodontic treatment in Serbia. *Srp Arh Celok Lek.* 2021;149(9-10):544-550
35. Agou S, Al-Sakkaf G, Barboud L, Elhussein M. Cross-cultural adaptation and validation of the malocclusion impact questionnaire for patients seeking orthodontic treatment. *J Orthod Sci.* 2022;11:37.