Cross-cultural adaptation of oral health-related quality of life measures used to assess the impacts of malocclusion and dentofacial deformities in Saudi Arabia: A literature review

Shoroog Hassan Agou

Abstract:
Since the World Health Organization broadened its definition of health, beyond biological boundaries, to include physical, emotional, and social wellbeing. Oral health-related quality of life (OHRQoL) became common outcome measure in clinical trials and epidemiological studies in Dentistry and Medicine. It is not surprising, therefore, to see quality of life as one of the programs of the Saudi 2030 vision. That said, it can be difficult to interpret the findings of OHRQoL research if the measures used were not appropriately adapted and validated in the population being studied. In this review article, the concept of cross-cultural adaptation of OHRQoL and its use in the Saudi context, as applied to orthodontic research, was discussed. An electronic search in PubMed and MEDLINE databases was conducted. A second search was conducted to locate methodological papers discussing cross-cultural adaptation and translations. Appraisal of relevant research was conducted to provide a better understanding of the process of adapting OHRQoL measures to assess the impact of malocclusion and dentofacial abnormalities on quality of life. This review pointed out important methodological concerns that warrant considerations during the translation and adaptation of OHRQoL measures.

Keywords:
Cross-cultural adaptation, malocclusion, oral health related quality of life, orthodontics, patient-reported outcomes, translational validity

Introduction

Since the World Health Organization broadened its definition of health, to include physical, emotional, and social well-being, subjective health measures evaluating the individual’s perspective are increasingly being used to complement biological measures of the disease. As health sciences advance, more emphasis is placed on the biopsychosocial perspective as opposed to the traditional biomedical model.

Consequently, an increasing amount of attention is being given to the concept of oral health-related quality of life (OHRQoL).[1]

A number of OHRQoL measures have appeared over the past 40 years. These instruments are essentially psychometric evaluations and tests that strive to evaluate OHRQoL around the various dimensions that comprise OHRQoL.[2] OHRQoL can be defined as “a person’s assessment of how the following factors affect his or her wellbeing: Functional factors; psychological factors; social factors; and the experience of...
pain/discomfort”. When these considerations center on oro-facial concerns, OHRQoL is assessed.[3]

Measures of OHRQoL are either generic or condition-specific. While generic measures are generally used to evaluate the impact of conditions and diseases on individuals providing a general assessment about health, condition- or disease-specific measures focus on measuring the impact of a particular condition, such as malocclusion, on quality of life. The literature seems to indicate that condition-specific instruments are more capable to detect small changes in health, and hence, are more helpful in the assessment of subjective treatment needs and treatment outcomes.[3]

Researchers interested in measuring OHRQoL have two options; Use the de novo method to develop a new measure, or use existing instruments after modification and “cross-cultural adaptation”.[4] Since the process of development of new instruments is complex [Figure 1], the use of an existing tool is recommended.[3] However, existing tools that are not validated in the language of the population being tested, need to go through a process of cross-cultural adaptation and psychometric testing.[5] Herdman [Table 1] reported several definitions of cross-cultural adaptation or cross-cultural equivalence.[6] These definitions underscore the salient influence of cultural characteristics on how OHRQoL is measured and interpreted.[7] Hence, the generalizability, validity, and reliability of translated measures are dependent on how well the process of cross-cultural adaptation was conducted. In fact, an appropriate translational validity can be considered a pre-requisite for the generation of meaningful data leading to valid conclusions of OHRQoL data.

A number of leading scientists in the field of orthodontic outcome research emphasized that the measurement of patient-based outcomes is central to the development of orthodontic oral health services.[8-13] In response to this worldwide movement, the concept of OHRQoL and the importance of patient-reported outcomes are increasingly being recognized by dental clinicians and researchers in Saudi Arabia. OHRQoL measures are, nowadays, commonly used to assess the impacts of malocclusion and dentofacial disharmony on quality of life amongst children, adolescents, and adults.[8-13]

The aim of this review was to examine how measures of OHRQoL were used to assess the impacts of malocclusion and dentofacial disharmony amongst children, adolescents, and adults in Saudi Arabia. In addition, the concept of cross-cultural adaptation of OHRQoL in the Saudi context, as applied to orthodontic research, was explored.

### Table 1: Definition of aspects of equivalence according to Herdman (1998)[6]

| Equivalence | Definition |
|-------------|------------|
| Conceptual  | Ways in which different populations conceptualize health and quality of life (QoL) and the values they place on different domains of health and QoL |
| Item        | Concerns the way in which domains are sampled. Item equivalence exists when items estimate the same parameters on the latent trait being measured and when they are equally relevant and acceptable in both cultures. |
| Semantic    | Concerned with the transfer of meaning across languages. |
| Operational | Refers to the possibility of using a similar questionnaire format, instructions, mode of administration, and measurement method (response format). |
| Measurement | Ensuring that different language versions of the same instrument achieve acceptable levels in terms of their psychometric properties - reliability, responsiveness, and validity. |
| Functional  | The extent to which an instrument does what it is supposed to do equally well in two or more cultures. |

![Figure 1: Flow chart showing the sequential steps required in developing patient-reported outcome measures](image)

**Materials and Methods**

An electronic search used the keywords “malocclusion,” “Arabic,” “cultural adaptation,” “Oral Health related Quality of Life,” and “validation” in PubMed and MEDLINE databases was conducted. A supplemental search of reference links was completed. Title and abstract evaluation of all papers were conducted. Papers assessing elderly or early childhood populations were excluded. Also, papers focusing on measuring generic impacts of oral diseases and disorders such as caries...
or periodontal diseases and those related to specific disorders or case reports were excluded. A second search was conducted to locate methodological papers discussing cross-cultural adaptation and translations. Cross-cultural adaptation of the measures employed in identified studies was evaluated using the criteria outlined by MacEntee and Brondani.\textsuperscript{[7]}

## Results

The search identified five OHRQoL measures suitable for the assessment of the impacts of malocclusion in adults. Of these, four had published attempts to translate and validate the Arabic language versions [Table 2]. The most commonly used instruments in Saudi studies were the short version of the Oral Health Impact Profile (OHIP-14), a generic OHRQoL measure, and the Orthognathic Quality of Life (OQOL) Questionnaire; a condition-specific measure for the assessment of dentofacial deformity. Table 3 summarizes the instruments available for the assessment of the impacts of malocclusion in children and adolescents. Of the nine measures identified, only four had published translations. Only one study reported the impacts of malocclusion in Saudi children, using The Child Version of the Michigan Oral Health-Related Quality of Life Scale. Overall, a total of seven studies assessed the impacts of malocclusion or cleft lip and palate on OHRQoL in Saudi Arabia. Cross-cultural adaptation of most measures involved forward/backward translation and pilot tests. Evaluation of the underlying construct, interpretations of item, or interval scales, and evaluation of convergent validity, discriminant validity, and responsiveness to clinical change of the translated measure were occasionally documented.

### Table 2: Summary of OHRQoL instruments used to assess the impacts of malocclusion in adults

| Instrument | Purpose | Age group | Arabic version validated and published | Countries were the Arabic instrument was used to assess malocclusion |
|------------|---------|-----------|----------------------------------------|---------------------------------------------------------------|
| The Oral Health Impact Profile (OHIP)\textsuperscript{[16]} | Generic OHRQoL could be used to assess the impacts of malocclusion | Children and adults | Saudi Arabia\textsuperscript{[15]} | None |
| The short version of the Oral Health Impact Profile (OHIP-14)\textsuperscript{[16]} | Generic OHRQoL could be used to assess the impacts of malocclusion | Children and adults | Sudan\textsuperscript{[17]} (The Sudanese-Arabic version of the questionnaire (OHIP-14s-ar)) | Saudi Arabia\textsuperscript{[18-21]} |
| The short version of the Oral Health Impact Profile (OHIP5-Ar)\textsuperscript{[19]} | Generic OHRQoL | Adults | Several Arabic speaking populations\textsuperscript{[22]} | None |
| The Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ)\textsuperscript{[23]} | Condition-specific OHRQoL measure to assess the impacts of dental aesthetics | Adults above 18-year-old | None | None |
| Oral Health-related Quality of Life (OHQoL-UK (W))\textsuperscript{[24]} | Generic instrument to measure the impact of oral health on quality of life. | Adults | Syria, Egypt, and Saudi Arabia\textsuperscript{[25]} | None |
| The Orthognathic Quality of Life Questionnaire (OQOL) (S. J. Cunningham et al., 2000; Susan J. Cunningham et al., 2002) | Condition-specific OHRQoL measure to assess the impacts of malocclusion, TMD, and orthognathic surgery in patients with dentofacial deformity | Adults | None | Saudi Arabia\textsuperscript{[27]} |

## Discussion

The notion of OHRQoL is strongly emerging in the Saudi dental literature. This increased use of patient-reported outcomes (PROs) as a primary or secondary outcome measure in clinical trials and epidemiological studies in Dentistry [Tables 2 and 3], is in line with the Quality of Life program of the Saudi 2030 vision, aiming at enhancing the quality of life of individuals and families. In general, the literature appears to support the idea that malocclusion affects a person's OHRQoL and encourages the use of OHRQoL measures in orthodontic outcome research. Eight validated Arabic measures were located and seven studies reported the impacts of malocclusion among children and adults. A general paucity of studies examining children and adolescents is noted only. One study assessed the impacts of malocclusion in children, and the measure employed was not validated for the purpose it was used for at the time of study.\textsuperscript{[96]}

Despite the superior performance of condition-specific instruments in measuring change, there seem to be a tendency to use generic OHRQoL measures to assess the impacts of malocclusion in the Saudi OHRQoL research. Condition-specific measures such as the Malocclusion Impact Questionnaire (MIQ) and the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), have not been used yet in Saudi Arabia. This might be due to the fact that the MIQ is yet to be cross-culturally validated and evaluated to confirm its generalizability and it should be assessed longitudinally to confirm its responsiveness i.e., detecting a change in OHRQoL overtime in the Saudi population.
Table 3: Summary of OHRQoL instruments used to assess the impacts of malocclusion in children and adolescents

| Instrument                                                                 | Purpose                                                                 | Age group          | Arabic version validated and published | Countries were the Arabic instrument was used to assess malocclusion |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------|----------------------------------------|---------------------------------------------------------------------|
| Oral Aesthetic Subjective Impact Scale (OASIS)\(^{[28]}\)               | To reflect orthodontic treatment need, it has not been applied as an outcome measure | 14-15-year-old children | None                                   | None                                                                |
| Child Oral Health Quality of Life Questionnaire (Child OH-QOL Questionnaire)\(^{[29,30]}\) | To assess a wide range of dental, oral, and oro-facial disorders.             | 10-14-year-old | Saudi Arabia\(^{[31]}\)                | Jordan (to assess trauma)\(^{[32]}\)                               |
|                                                                         |                                                                         | 10-14-year-old (Short form)  | Lebanon\(^{[33]}\)                  | Syria (to assess CLP)\(^{[34]}\)                                   |
|                                                                         |                                                                         | 8-10-year-old            | Saudi Arabia\(^{[35]}\)             | None                                                               |
|                                                                         |                                                                         | Parents: PPQ Parents: FIS | Saudi Arabia\(^{[36]}\) (CLP, malocclusion, and caries) | Saudi Arabia\(^{[37]}\)                                           |
|                                                                         |                                                                         | 11-12-year-old           | Short version tested in Saudi Arabia\(^{[38]}\) | None                                                               |
| Child-Oral Impacts of Daily Performance (Child-OIDP)\(^{[39]}\)          | It assesses the oral impacts on children’s daily life in relation to eight daily performances | 11-12-year-old | Sudani\(^{[40]}\)                      | Saudi Arabia\(^{[41]}\)                                           |
|                                                                         |                                                                         | Saudi Arabia\(^{[42]}\) Unpublished thesis |                            |                                                      |
| Child Oral Health Impact Profile (COHIP)\(^{[43]}\)                     | It assesses the oral impacts on children’s daily life                      | 8-15-year-old | Libya\(^{[44]}\)                        | Kuwait (parents of CLP patients)\(^{[45]}\)                        |
| Malocclusion Impact Questionnaire (MIQ)\(^{[46,47]}\)                   | Specific to assessment of malocclusion                                     | 10-16-year-old | Unpublished Thesis\(^{[48]}\)           | None                                                                |
| OHRQoL Hypodontia\(^{[49,50]}\)                                          | Specific to hypodontia                                                     | 11-18-year-old | None                                   | None                                                                |
| Teen Oral Health-Related Quality of Life instrument\(^{[51]}\)         | Generic instruments for teen                                               | 13-18-year-old | None                                   | None                                                                |
| The Second International Collaborative Study-Oral Health-Related Quality of Life Questionnaire for Children (ICSII-OHRQOL)\(^{[52]}\) | Assessment of generic oral health-related quality of life                | Children          | None                                   | None                                                                |
| Michigan Oral Health-Related Quality of Life Scale-Child Versi (Citation) on (ECOHIS)\(^{[53]}\) | Assessment of the impacts of early childhood caries                     | Younger age groups | Saudi Arabia\(^{[54,55]}\)             | Saudi Arabia\(^{[56]}\) (translation details were provided as part of the study) |

More importantly, this review points out important methodological concerns regarding the process of cross-cultural adaptation that warrants thorough considerations. With the exception of few studies, there seems to be a trend to use OHRQoL measures previously developed in other countries, after colloquial translations and pilot testing, but, before assessing the cross-cultural equivalence of the translated measure in the population being studied.\(^{[17]}\) For example, while the OHIP has been adapted and validated using a systematic approach in the Saudi population,\(^{[18]}\) its short form commonly used in orthodontic outcome studies\(^{[18,19]}\) has not been validated to this date. Similarly, the QOQL questionnaire was used to assess outcomes of orthognathic treatment of Saudi patients, before testing its psychometric properties amongst Saudis.\(^{[17]}\)

Cross-cultural equivalence entails a solid grasp of conceptual, semantic, operational, and functional aspects of the translation process.\(^{[6]}\) For example, in a pilot study conducted to test the validity of the Adult-Oral Impact on Daily Performance questionnaire, originally intended for 12-year-olds and above, amongst 12-year-olds, “the children found the questions complex” and “a shift from the adult to the child version of the measure had to be made”. Also, “the children were unable to respond appropriately to the self-administered questionnaire, so face-to-face interviews were used, and while the questionnaire was translated to classical Arabic, it was read out to each student individually in a Sudanese dialect to ease the comprehension based on findings from pilot tests.\(^{[40]}\) This example underscores the importance of pilot testing and questions the comparability of findings across countries if questionnaires were used without appropriate cross-cultural adaptation. The study also raises important questions about the applicability of using the same Arabic translation across Arab-speaking countries with different dialects, not to mention cultures. Cultural variations strongly influence the understanding of questions and the associated health dimensions, which indeed, influence participants’ responses.\(^{[7]}\)

Although there seems to be a general agreement about the influence of culture on OHRQoL reports, there
A comprehensive review of Arab Arabic oral health related quality of life (OHRQoL) measures has been carried out in Saudi Arabia. The concept of OHRQoL and its relationship to treatment needs and outcomes is a “hot topic” in dentistry and orthodontics. It can be difficult for the clinician to interpret the findings of OHRQoL research. In this article, the concept of OHRQoL and patient-reported outcomes were reviewed. A list of current OHRQoL measures, applicable to orthodontics, was provided. An extensive appraisal of current research in Saudi Arabia was carried out to assess how these instruments were used to assess the impacts of malocclusion in Saudi Arabia.

Table 4: Summary of approaches to cross-cultural adaptation outlined in the dental literature

| COSMIN Checklist | Alghadeer et al.[7] | MacEntee and Brondani Criteria[7] |
|------------------|----------------------|----------------------------------|
| Content Validity | Forward translation  | Forward/backward translation by committee |
| Structural validity | Synthesis of the translation | Underlying construct |
| Internal consistency | Back translation | Item interpretations |
| Cross-cultural validity/measurement invariance | Committee review | Interval scales |
| Measurement error and Reliability | Pre-test | Convergent validity |
| Criterion validity | Co-ordinating committee for appraisal of the adaptation process | Discriminant validity |
| Hypotheses testing for construct validity | | Responsiveness to clinical change |
| Responsiveness | | Pilot tests. |
| Translation process | | |

With the increased demands to provide evidence for treatment outcomes,[62,63] the concept of OHRQoL and its relationship to treatment needs and outcomes is a “hot topic” in dentistry and orthodontics. It can be difficult for the clinician to interpret the findings of OHRQoL research. In this article, the concept of OHRQoL and patient-reported outcomes were reviewed. A list of current OHRQoL measures, applicable to orthodontics, was provided. An extensive appraisal of current research in Saudi Arabia was carried out to assess how these instruments were used to assess the impacts of malocclusion in Saudi Arabia.

Evaluation of published Arabic language translation of OHRQoL measures using the MacEntee and Brondani criteria discerns that most translations involved forward/backward translation and pilot tests, for the most part. Only a few studies reported careful examination of the underlying construct, interpretations of item, or interval scales, and evaluation of convergent validity, discriminant validity, responsiveness to clinical change, and pilot tests.[7]

This review highlights the importance of using proper guidelines for ensuring the quality of studies reporting on the translation and cross-cultural adaptation of OHRQoL measures. The COSMIN Study Design checklist was designed to assess the measurement properties of existing PRO measures.[61] A detailed checklist to assess the quality of the translation process and cross-cultural validity testing of the translated measure is provided.[61] According to the COSMIN checklist, “a good translation process will likely result in a more valid version of the PRO measure in the translated language.”

This review is not without limitations; however, it lays down the grounds for a systematic review for each of the instruments being used with careful examination of its cross-cultural equivalence and psychometric performance in the Saudi population. The findings emphasize the need to create a central repository of translated measures and associated data to continuously evaluate the validity argument of these measures.

Conclusions
Most studies seemed to report an accurate vernacular translation and reliability of the measure being used. However, the notion of cross-cultural equivalence is yet to be applied in the translated measures. The delay in adapting quality guidelines and consistency in reporting may impede the progress of research in the field of orthodontic OHRQoL. Until this is achieved, comparisons of scores between cultures might be challenging and less meaningful.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA 1995;273:59-65.
2. Sischo L, Broder HL. Oral health-related quality of life: What, why, how, and future implications. J Dent Res 2011;90:1264-70.
3. Cunningham SJ, Garratt AM, Hunt NP. 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.
4. Alghadeer A, Newton T, Dunne S. Cross cultural adaptation of oral-health-related quality of life measures. Dent Update 2010;37:706-8.
5. Baiju RM, Peter E, Varghese NO, Sivaram R, Streiner DI. What makes a tool appropriate to assess patient-reported outcomes of periodontal disease? J Indian Soc Periodontol 2017;21:90-6.
6. 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;7:323-35.
7. MacEntee MI, Brondani M. Cross-cultural equivalence in translations of the oral health impact profile. Community Dent Oral Epidemiol 2016;44:109-18.
8. Andiappan M, Gao W, Bernabé E, Kandala N-B, Donaldson AN. Malocclusion, orthodontic treatment, and the Oral health impact profile (OHIP-14): Systematic review and meta-analysis. Angle Orthod 2015;85:493-500.
9. Araki M, Yasuda O, Otagawa T, Tumurkhuu T, Ganburged G, Bazar A, et al. Associations between malocclusion and Oral health-related quality of life among mongolian adolescents. Int J Environ Res Public Health 2017;14:902.
10. Zheng D-H, Wang Y-X, Su Y-R, Zhao S-Y, Xu C, Kong C, et al. Assessing changes in quality of life using the Oral health impact profile (OHIP) in patients with different classifications of malocclusion during comprehensive orthodontic treatment. BMC Oral Health 2015;15:148.
11. Tajima M, Kohzuki M, Azuma S, Saeki S, Meguro M, Sugawara J. Difference in quality of life according to the severity of malocclusion in Japanese orthodontic patients. Tohoku J Exp Med 2007;212:71-80.
12. Sun L, Wong HM, McGrath CP. Association between the severity of malocclusion, assessed by occlusal indices, and oral health related quality of life: A systematic review and meta-analysis. Oral Health Prev Dent 2018;16:211-23.
13. Rusanen J, Lahti S, Tolvanen M, Pirittinniemi P. Quality of life in patients with severe malocclusion before treatment. Eur J Orthod 2010;32:43-8.
14. Slade GD, Spencer AJ. Development and evaluation of the Oral health impact profile. Community Dent Health 1994;11:3-11.
15. Al-Jundi MA, Szemépety A, John MT. An Arabic version of the Oral health impact profile: Translation and psychometric properties. Int Dent J 2007;57:84-92.
16. Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997;25:284-90.
17. Khalifa N, Allen PF, Abu-bakr NH, Abdel-Rahman ME. Psychometric properties and performance of the Oral health impact profile (OHIP-14-ar) among Sudanese adults. J Oral Sci 2013;55:123-32.
18. Hassan AH, Hobani NM, Almokri SM, Almokri NM, Alotibi FG, Alshouibi EN. Effect of anterior crowding or spacing on oral health-related quality of life: A cross-sectional study. Patient Prefer Adherence 2018;12:461-5.
19. Hassan AH, Amin HE-S. Association of orthodontic treatment needs and oral health-related quality of life in young adults. Am J Orthod Dentofacial Orthop 2010;137:42-7.
20. Altouki NH, Albrahim MA, Hassan AH, Natto ZS, Alhajrasi MK. Oral health-related quality of life of Saudi young adults with vertical discrepancies in occlusion. Patient Prefer Adherence 2020;14:1021-6.
21. Alqefari J, Albelaihi R, Elmoazen R, Bilal R. Three-dimensional assessment of the Oral health-related quality of life undergoing fixed orthodontic therapy. J Int Soc Prev Community Dent 2019;9:72-6.
22. Naik A, John MT, Kohli N, Self K, Flynn P. Validation of the English-language version of 5-item Oral health impact profile. J Prosthodont Res 2016;60:85-91.
23. Alhajj MN, Halboub E, Khalifa N, Amran AG, Reissmann DR, Abdullah AG, et al. Translation and validation of the Arabic version of the 5-item Oral health impact profile: OHIPS-Ar. Health Qual Life Outcomes 2018;16:218.
24. Klagges U, Claus N, Wehrbein H, Zentner A. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. Eur J Orthod 2006;28:103-11.
25. McGrath C, Bedi R. An evaluation of a new measure of oral health related quality of life—OHQoL-UK (W). Community Dent Health 2001;18:138-43.
26. McGrath C, Alkhathib MN, Al-Munif M, Bedi R, Zaki AS. Translation and validation of an Arabic version of the UK oral health related quality of life measure (OHQoL-UK) in Syria, Egypt and Saudi Arabia. Community Dent Health 2003;20:241-5.
27. Abdullah WA. Changes in quality of life after orthognathic surgery in Saudi patients. Saudi Dent J 2015;27:161-4.
28. Mandall NA, McCord JF, Blinkhorn AS, Worthington HV, O’Brien KD. Perceived aesthetic impact of malocclusion and oral self-perceptions in. Eur J Orthod 2000;22:175-83.
29. Jokovic A, Locker D, Stephens M, Kenny D, Tompson B, Guyatt G. Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. J Dent Res 2002;81:459-63.
30. Jokovic A, Locker D, Guyatt G. Short forms of the child oral-health related quality of life questionnaire (CPQ11-14): Development and initial evaluation. Health Qual Life Outcomes 2006;4:4.
31. Brown A, Al-Khayal Z. Validity and reliability of the Arabic translation of the child oral-health-related quality of life questionnaire (CPQ11-14) in Saudi Arabia. Int J Paediatr Dent 2006;16:405-11.
32. Kassis A, El Osta N, Tubert-Jeannin S, Henequin M, El Osta L, Ghoubri J. Cross-cultural adaptation and validation of the child perceptions questionnaire (CPQ (11-14)) among children in Lebanon. BMC Oral Health 2018;18:18.
33. Rajab LD, Abu Al Huda D. Impact of treated and untreated traumatic dental injuries on oral health-related quality of life among 12-year-old schoolchildren in Amman. Dent Traumatol 2019;35:153-62.
Agou: Review of malocclusion Arabic oral health related quality of life measures

34. Dak-Albab RJ, Dashash MA. The influence of socioeconomic status on oral health-related quality of life among Syrian children with cleft lip, or palate, or both. Saudi Med J 2013;34:181-6.

35. Bhayat A, Ali MAM. Validity and reliability of the Arabic short version of the child oral health-related quality of life questionnaire (CPQ 11-14) in Medina, Saudi Arabia. East Mediterr Health J 2014;20:477-82.

36. Al-Bhaihed D, El-Houseiney AA, Farsi NJ, Farsi NM. Validity and reliability of the Arabic version of the child perceptions questionnaire for 8-10-year-old children. Qual Life Res 2020. doi: 10.1007/s11136-020-02545-y. Online ahead of print.

37. Al-Riyami IA, Thomson WM, Al-Harthi LS. Testing the Arabic short form versions of the parental-caregivers perceptions questionnaire and the family impact scale in Oman. Saudi Dent J 2016;28:31-35.

38. Baghdadi ZD. Effects of dental rehabilitation under general anesthesia on children's oral health-related quality of life using proxy short versions of OHRQoL instruments. ScientificWorldJournal 2014;2014:308439.

39. Cherunpong S, Tsakos G, Sheilham A. Developing and evaluating an oral health-related quality of life index for children; the CHILD-OIDP. Community Dent Health 2004;21:161-9.

40. Nurelhuuda NM, Ahmed MF, Trovik TA, Åström AN. Evaluation of oral health-related quality of life among Sudanese schoolchildren using Child-OIDP inventory. Health Qual Life Outcomes 2010;8:152.

41. Alzahrani AAH, Alhassan EM, Albanghali MA. Association between oral diseases and impact on daily performance among male Saudi schoolchildren. Clin Exp Dent Res 2019;5:655-64.

42. Almaliki S. Developing, Adapting, Validating an Arabic Version of the Child-Oral Impacts on Daily Performance Index for Use Among 11 and 12 Year Old Children in Saudi Arabia. London: University College London; 2010.

43. Broder HL, McGrath C, Cisneros GJ. Questionnaire development: Face validity and item impact testing of the Child oral health impact profile. Community Dent Oral Epidemiol 2007;35(Suppl 1):8-19.

44. Arheiam AA, Baker SR, Ballo L, Elareibi I, Fakron S, Harris RV. The development and psychometric properties of the Arabic version of the child oral health impact profile-short form (COHIP- SF 19). Health Qual Life Outcomes 2017;15:218.

45. AlAnazi FN, AlHayyan WA, Pani SC. Impact of presurgical nasoalveolar molding on the parental perceptions of Oral health-related quality of life of children with cleft lip and palate. Saudi Dent J 2014;21:152-5.

46. Benson PE, Cunningham SJ, Shah N, Gilchrist F, Baker SR, Hodges SJ, 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;43:14-23.

47. Patel N, Hodges SJ, Hall M, Benson PE, Marshman Z, Cunningham SJ. 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;43:7-13.

48. Mohamed AM. A Validation Study of The Malocclusion Impact Questionnaire To Measure Oral Health-Related Quality of Life in Young Arabs With Malocclusion. MBRU; 2019.

49. Akram AJ, Jerreat AS, Woodford J, Sandy JR, Ireland AJ. Development of a condition-specific measure to assess quality of life in patients with hypodontia. Orthod Craniofac Res 2011;14:160-7.

50. Akram AJ, Ireland AJ, Postlethwaite KC, Sandy JR, Jerreat AS. Assessment of a condition-specific quality-of-life measure for patients with developmentally absent teeth: Validity and reliability testing. Orthod Craniofac Res 2013;16:193-201.

51. Wright WG, Spiro A 3 rd, Jones JA, Rich SE, Garcia RI. Development of the teen oral health-related quality of life instrument. J Public Health Dent 2017;77:115-24.

52. Tapsoob H, Deschamps JP, Leclercq MH. Factor analytic study of two questionnaires measuring oral health-related quality of life among children and adults in New Zealand, Germany and Poland. Qual Life Res 2000;9:559-69.

53. Filstrup SL, Briskie D, da Fonseca M, Lawrence L, Wandera A, Inglehart MR. Early childhood caries and quality of life: Child and parent perspectives. Pediatr Dent 2003;25:431-40.

54. Farsi NJ, El-Houseiney AA, Farsi DJ, Farsi NM. Validation of the Arabic version of the Early childhood oral health impact scale (ECOHIS). BMC Oral Health 2017;17:60.

55. Farsi DJ, Farsi NJ, El-Housseiney AA, Damanhoury WH, Farsi NM. Responsiveness of the Arabic version of the ECOHIS to dental rehabilitation under general anaesthesia. Int J Paediatr Dent 2018;28:52-61.

56. Hassan AH, Hassan MH, Linjawi AI. Association of orthodontic treatment needs and oral health-related quality of life in Saudi children seeking orthodontic treatment. Patient Prefer Adherence 2014;8:1571-9.

57. Behling O, Law K. Translating Questionnaires and Other Research Instruments: Problems and Solutions. Thousand Oaks: Sage; 2000. p. 7-133.

58. Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, et al. The COSMIN study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. J Clin Epidemiol 2010;63:737-45.

59. Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. J Clin Epidemiol 1993;46:1417-32.

60. Allison P,Locker D, Johovic A, Slade G. A cross-cultural study of oral health values. J Dent Res 1999;78:643-9.

61. Mokkink LB, Prinsen CAC, Patrick DL, Alonso J, Bouter LM, de Vet Hcw, Terwee CB. COSMIN Study Design checklist for Patient-reported outcome measurement instruments. Available from: https://www.cosmin.nl/wp-content/uploads/COSMIN-study-designing-checklist_final.pdf (2019). [Last accessed on 2020 Sep 21].

62. Corson MA, Boyd T, Kind P, Allen PF, Steele JG. Measuring oral health: Does your treatment really make a difference. Br Dent J 1999;187:481-4.

63. Kressin NR. Symposium on self-reported assessments of oral health outcomes. Introduction. J Dent Educ 1996;60:485-7.