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Cross-cultural adaptation and validation of the malocclusion impact questionnaire for patients seeking orthodontic treatment

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Abstract

OBJECTIVES: To assess the adaptability and validity of the Arabic version of the Malocclusion Impact Questionnaire (MIQ-AR) in patients seeking orthodontic treatment.

MATERIALS AND METHODS: This cross-sectional survey was conducted on a convenience sample of 77 Arabic speaking, healthy, 10–16-year-old children, selected based on their personal perception of "needing braces.". The participants completed the MIQ-AR and the Child Perceptions Questionnaire for children aged 11–14 (CPQ11-14), answered two global questions, and had their Index of Orthodontic Treatment Need, Dental Health Component (IOTN.DHC) scores recorded. Construct validity was examined by measuring the correlation between the MIQ-AR score and the responses to the two global questions. Criterion validity was examined by measuring the correlation between the MIQ-AR and both the IOTN.DHC and CPQ11-14 scores.

RESULTS: Moderate positive correlations were observed between the MIQ-AR scores and the first ($\rho = 0.320$, $P < 0.001$) and second global questions ($\rho = 0.388$, $P < 0.001$). A strong positive correlation was found between the total CPQ11-14 and MIQ-AR scores ($\rho = 0.597$, $P < 0.001$). A positive gradient was observed between the MIQ-AR scores and IOTN.DHC scores.

CONCLUSION: Our results indicate that the MIQ-AR is a valid tool for measuring oral health-related quality of life in patients with malocclusion, with good psychometric parameters. These preliminary findings require further testing in various settings involving a larger and more diverse sample.

Keywords:

Cross-cultural validation, malocclusion, malocclusion impact questionnaire, oral health–related quality of life Introduction

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Oral Health–Related Quality of Life (OHRQoL) is concerned with how an individual's oral health impacts their comfort during eating, sleeping, or social situations.[1] It has many applications in research, and it has been used in survey research, including population-based needs assessments and as an outcome measure in observational and experimental clinical trials.[2] Measures of OHRQoL, such as the Malocclusion Impact Questionnaire (MIQ) and the Child Perceptions Questionnaire for children aged 11–14 (CPQ11-14), were developed in English-speaking environments, and thus they cannot be directly applied globally. Cultural and language barriers that exist between Arabs, Western, and European countries necessitate adapting or developing new OHRQoL instruments, as many core values are different, which define the population's view of health. It is also crucial to test whether an instrument has consistent findings across different settings within a subpopulation. This research aims

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to evaluate the validity and reliability of the MIQ-AR against that of the CPQ11-14 among Saudi patients seeking orthodontic treatment.

The OHRQoL of a patient can be expressed and observed in a series of domains concerning different aspects of their life. It was previously measured using generic instruments that lacked specificity in certain aspects, such as malocclusion was used historically. In recent years, more specific instruments have been created to target specific problems.[3] Condition-specific instruments are more practical in clinical practice as they provide adequate responsiveness and are usually less extensive and more targeted, making them more palatable to the patients.[4]

The MIQ was developed to assess how adolescents perceive their oral health and its impact on the quality of their lives. It consists of 17 questions, with a 3-point severity scale for responses: "not at all," "a little," and "a lot." Three main themes were identified among the participants: the appearance of their teeth, their impact on social life, and oral health and function.[5,6]

Tools such as the MIQ are important in evaluating the effectiveness of orthodontic treatment. Malocclusion is the third most prevalent oral pathology globally, and in a study conducted in the western region of Saudi Arabia, 71.6% needed orthodontic treatment when assessed by a professional judgment.[7,8] Thus, such tools are important in evaluating the effectiveness of orthodontic treatment as malocclusion also has a significant negative impact on the OHRQoL, especially in the psychological domain.[9]

In a study by Hassan A. *et al.*, there was a great significance between the children's Index of Orthodontic Treatment Need (IOTN) scores and their OHRQoL, which impacted them both physically and psychologically. These results demonstrate the importance of further testing OHRQoL measures in children as they aid in the understanding of malocclusion and orthodontic treatment.[7]

However, although the CPQ11-14 has been validated in Saudi Arabia, validation of a more condition-specific OHRQoL measure, the MIQ, which is more sensitive and responsive as it is both shorter and easier for children to comprehend and complete,[10,11] has not yet been undertaken. A summary of the literature review is presented in Table 1.[12-16]

Materials and Methods

Ethical approval

Ethical approval was obtained and approved by the research ethics committee at King Abdulaziz University (proposal number 004-13).

Data collection

A package of four documents was compiled to comprehensively collect data from each subject. The requisite forms, described below, are provided in appendices.

Table 1: Summary of comparison between other similar validated malocclusion impact questionnaire versions

Author (Year)	Country	Age Group	Sample Size	Setting	Study Design	Main Finding	Main Limitations	Method of Validity
Mohamed Hasab-Elrasoul Ali Mohamed (2019)	Dubai, UAE Alexandria, Egypt Khartoum, Sudan	10-16 years old	193	3 University Orthodontic Clinics	Cross-sectional	(ρ=0.710, *P*<0.001) Mean MIQ score 10.1	Responder bias Presence of parents/family members	MIQ-AR with CPQ11-14ISF16
Bourzgui *et al.* (2019)	Casablanca, Morocco	12-17 years old	94	5 Public schools	Cross-sectional	(NZ Pearson ρ=0.625, UK ρ=0.751) Mean MIQ score 16	Nonclinical setting Sample selection was based on school units not individuals Responder bias Parent's influence while growing up	MIQ with ICON
Benson *et al.* (2016)	Dunedin, New Zealand	10-16 years old	66	University Orthodontic Clinic	Cross-sectional	(ρ=0.625, *P*<0.001) Mean MIQ score 7.1	Convenience sample which might not be representative	MIQ with CPQ11-14ISF16 and 2 Global Questions
Benson *et al.* (2014)	Sheffield, UK	10-16 years old	184	Orthodontic Clinics, Dental Hospital	Cross-sectional	(ρ=0·751, *P*<0·001) Mean MIQ score 11.6	Responder bias External validity: as the sample was from one clinical setting and the lack of variety in ethnicity of the participants	MIQ with CPQ11-14ISF16 and 3 Global Questions

MIQ: Malocclusion Impact Questionnaire; MIQ-AR: Malocclusion Impact Questionnaire-Arabic; CPQ 11-14 ISF 16: 16 question short form of the Child Perception Questionnaire for 11–14-year-olds

1. A document for demographic data.
2. The CPQ11-14 developed by Foster Page *et al*.[5] was previously validated in Saudi Arabia by Brown and Al-Khayal.[11]
3. The MIQ developed by Patel *et al*.,[6] translated by Mohamed Hasab-Elrasoul, with no validation in Saudi Arabia.
4. The IOTN developed by Brook & Shaw.[15]

To test for validity, both subjective and objective measures were used. The objective measure was the IOTN. Subjective measures were subcategorized into generic (CPQ 11-14) and condition-specific measures (MIQ-AR). For the MIQ-AR, each question had a score of 0–2, whereas the CPQ11-14 had scores of 0–4. Furthermore, the participants were also asked to respond to two global questions: "Overall, how much do your teeth bother you?" and "Overall, how much do your teeth affect your life?" on a scale of 1 to 5 with 1 being "Not at all" and 5 being "A lot."

Participants

For cross-sectional validation, a total of 103 patients were approached, and a convenience sample of 77 subjects attending King Abdulaziz University Dental Hospital (KAUDH), a governmental hospital, was selected based on their personal perception of "needing braces" from patients attending pediatric, comprehensive care, student and general practitioner clinics, as well as patients treated by postgraduates. Patients aged 10–16 years old, who spoke Arabic, and were seeking orthodontic treatment were included in this study. Exclusion criteria included patients who had a history of or were currently undergoing orthodontic treatment, had a history of orthognathic surgery, had syndromic congenital facial deformities, had complex medical conditions, or did not speak Arabic.

Potential participants were approached during their follow-up visits and were asked whether they thought they needed braces. Those who responded positively were briefly informed about the research purpose, and their guardian/parent was given the consent form to sign. The children were encouraged to complete the questionnaires without parental guidance and hand them back.

After the participants completed the questionnaires, a quick examination was performed by general practitioners to fill in the IOTN form. A separate data collection sheet was filled in by the examiner with some more information, including the origin of the patient and his/her overall health. The paper forms were collected and kept in organized folders, which were later entered into an Excel spreadsheet (v2010, Microsoft Corporation). A sub-sample of 24 patients was contacted again after 2 weeks to complete the same questionnaires to test for test-retest reliability, provided that they had not undergone any dental procedure since the last time. For intraexaminer reliability testing, 10 study models were chosen. The intraclass correlation coefficient (ICC) was 0.982, indicating excellent repeatability and reproducibility.

Statistical analyses

The data were analyzed using SPSS statistical software (v20, IBM Corporation). For all the statistical tests, Spearman's correlation was used with a significance level set at ($P \leq 0.05$).

Results

Demographic characteristics

A total of 77 patients were included in this study, with a response rate of 100%. Twenty-four of these participants responded during the follow-up after 2 weeks. A total of 54.5% of the respondents were females. The demographic data are presented in Table 2.

Descriptive analyses

One participant had three unanswered responses and one had five, both in the child perception questionnaire. The responses of the participants to the two global questions are listed in Table 3. Table 4 shows the distribution of the participants' responses to the CPQ11-14 and MIQ-AR questionnaires. More detailed responses to the positively worded, negatively worded, and neutral questions in the MIQ-AR can be seen in Table 5. The distribution of the IOTN scores determined by the data collectors is presented in Table 6, whereas the results of the comparison of the IOTN data with that of the MIQ-AR data are presented in Table 7. Finally, the correlation between the MIQ-AR score and age, sex, global question 1, global question 2, and the CPQ11-14 scores were calculated. These are presented in Table 8.

Discussion

The MIQ was developed in English-speaking countries, and we identified the need for an Arabic version that

Table 2: Demographic characteristics (age and sex) (*n*=77)

	n	%
Sex		
Female	42	54.5
Male	35	45.5
Age		
10	21	27.3
11	9	11.7
12	12	15.6
13	14	18.2
14	7	9.1
15	4	5.2
16	10	13.0

Table 3: Responses of the participants (*n*=77) to the two global questions

Global Question	"Not at all"	"A little"	"Moderately"	"Most of the time"	"A lot"
Overall, how much do your teeth bother you?	16 (23.4%)	25 (32.5%)	12 (15.6%)	13 (16.9%)	9 (11.7%)
Overall, how much do your teeth affect your life?	36 (46.8%)	20 (26.0%)	10 (13.0%)	6 (7.8%)	5 (6.5%)

Table 4: Descriptive data for the Child Perceptions Questionnaire and the Malocclusion Impact Questionnaire-Arabic responses of the participants (*n*=77)

Questionnaire and Domains	Mean (SD)	Min-Max
CPQ11-14		
Oral symptoms	6.49 (3.719)	0-15
Functional limitations	6.99 (5.476)	0-25
Emotional limitations	7.81 (7.039)	0-34
Social wellbeing	7.05 (5.343)	0-23
Total score	28.34 (19.393)	0-70
MIQ-AR		
Total score	7.30 (7.231)	0-29

CPQ11-14: Child Perceptions Questionnaire for 11-14 year old; MIQ-AR: Malocclusion Impact Questionnaire-Arabic

Table 5: Responses of the participants to the Arabic version of the malocclusion impact questionnaire (*n*=77)

	"Not at all"	"A little"	"A lot"
MIQ-AR Positive Items			
Happy	19 (24.7%)	28 (36.4%)	30 (39.0%)
Good looking	13 (16.9%)	30 (39.0%)	34 (44.2%)
Confident	7 (9.1%)	30 (39.0%)	40 (51.9%)
Normal	4 (5.2%)	24 (31.2%)	49 (63.6%)
MIQ-AR Negative Items			
Sad	52 (67.5%)	16 (20.8%)	9 (11.7%)
Nervous	54 (70.1%)	20 (26.0%)	3 (3.9%)
Shy	47 (61.0%)	22 (28.6%)	8 (10.4%)
Rest of MIQ-AR Items			
Smile	9 (11.7%)	27 (35.1%)	41 (53.2%)
Laugh	7 (9.1%)	13 (16.9%)	57 (74.0%)
Seeing photographs	5 (6.5%)	17 (22.1%)	55 (71.4%)
Talking in public	5 (6.5%)	14 (18.2%)	58 (75.3%)
Others having better teeth	4 (5.2%)	23 (29.9%)	50 (64.9%)
Being bullied	8 (10.4%)	19 (24.7%)	50 (64.9%)
Making friends	3 (3.9%)	6 (7.8%)	68 (88.3%)
Fitting in with friends	1 (1.3%)	11 (14.3%)	65 (84.4%)
Cover with hand	8 (10.4%)	15 (19.5%)	54 (70.1%)
Biting some food	2 (2.6%)	17 (22.1%)	58 (75.3%)

MIQ-AR: Malocclusion Impact Questionnaire-Arabic

Table 6: Summary of Index of orthodontic treatment need, dental health component scores (*n*=77)

IOTN.DHC	*n* (*n*=77)	%
1	5	6.5
2	15	19.5
3	20	26.0
4	21	27.3
5	16	20.8

IOTN.DHC: Index of Orthodontic Treatment Need, Dental Health Component

is validated in each Arab country, as there are vast differences between cultures even within the region.

This study aimed to assess the psychometric properties of the existing Arabic translated version[] (MIQ-AR), by Mohamed Hasab-Elrasoul, across the local population of Saudi Arabia. The MIQ-AR was found to be valid and responsive, with good psychometric properties, and our results were comparable to findings within the region and globally. We tested the construct and criterion validity of the MIQ-AR by examining the relationship between the MIQ-AR scores and the responses to the two global questions and the CPQ11-14, respectively. We found a moderate positive correlation between the MIQ-AR scores and the responses to the two global questions: "Overall, how much do your teeth bother you?" and "Overall, how much do your teeth affect your life?" [Table 8], confirming the construct validity.

These results also correspond with the results in the thesis by Mohamed Hasab-Elrasoul, with (ρ =0.599, $P < 0.001$ and ρ =0.611, $P < 0.001$) for the first and second global questions, respectively. Benson *et al.*[13] in NZ with (ρ =0.661 and ρ =0.583, $P < 0.001$) for the first and second questions, respectively. We also found a strong, positive, and statistically significant correlation between the MIQ-AR scores and the CPQ11-14 scores confirming criterion validity. Test-retest reliability was assessed by comparing the total score of the initial MIQ-AR score and the score at the 2-week follow-up. We found that the two scores were comparable.

Examining the correlation between the total MIQ-AR score and the IOTN.DHC score, a positive gradient was observed, except for score 4 (4.95), where the gradient significantly decreased. Bourzgui *et al.*[12] performed a similar comparison in the Moroccan translation but evaluated the correlation between the total MIQ-AR scores and normative orthodontic treatment need according to the Index of Complexity, Outcome, and Need (ICON), which also showed no significant correlation (-0.129). ICON showed that most of the sample size (60.63%) needed orthodontic treatment, but when compared with the scores of MIQ-AR answers, Bourzgui showed no correlation between the two, suggesting that there may be some biases in the self-reported answers in the MIQ-AR. showed no correlation between the two, suggesting that there may be some biases in the self-reported answers in the MIQ-AR.

Considering the limitations observed in the literature, all samples were recruited from a governmental institution

with no nationality or financial barriers, providing a diverse pool of patients in the area.

Finally, we found that there were no significant correlations between the MIQ-AR score and age or sex. The ratio of females (54.5%) to males (45.5%) was slightly higher, indicating that a higher proportion of female participants sought orthodontic treatment. These results are comparable to the UAE, Moroccan, NZ, and the UK samples, with a higher proportion of females in all four groups.

Limitations of the study

The results of the comparison between the MIQ-AR score and the IOTN.DHC scores discussed above may be explained by the small sample size and lack of diversity that may arise as the subjects were recruited from the same community, despite efforts made to diversify the sample pool. Responder bias may also have been presented in two forms: the subjects might have answered the questionnaire with responses they thought the examiner wanted to include, and the presence of the child's parent/guardian might have influenced their responses while answering the questions.

Recommendations for future studies

Despite the similarities between Arab countries, significant differences still exist. For the data to be representative of the local community, a larger and more diverse sample is required. Moreover, as the participants were considerably younger, shorter versions of the questionnaires may be more convenient. Online forms could also have been used instead of hard copies to facilitate data collection and entry, thereby minimizing the chances of human error. Longitudinal follow-up is recommended after patients have had their treatment to further strengthen the results.

Table 7: Distribution of descriptive data between the different scores of the Arabic version of the malocclusion impact questionnaire and the index of orthodontic treatment need, dental health component (*n*=77)

IOTN.DHC	Mean (SD) Range	*n*
MIQ-AR Total score		
1	5.40 (8.295) 20	5
2	5.80 (4.376) 15	15
3	9.60 (9.225) 29	20
4	4.95 (6.045) 23	21
5	5.40 (8.295) 20	5

MIQ-AR: Malocclusion Impact Questionnaire-Arabic; IOTN.DHC: Index of Orthodontic Treatment Need, Dental Health Component

Conclusion

In this study, we aimed to validate the MIQ-AR. We concluded that the MIQ-AR had good construct and criterion validity, test-retest reliability, and is a valid and reliable tool for measuring OHRQoL in patients with malocclusion in the Saudi population aged 10–16 years. These preliminary findings, involving a convenience sample of children seeking treatment at the hospital should be validated with further testing in various settings.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Ethical approval

Ethical approval was obtained from the research ethics committee at King Abdulaziz University (proposal number 004-13).

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Table 8: Correlation between the different scores of the MIQ-AR with different variables (*n*=77)

	Sex	Age	Global Questions 1	Global Question 2	CPQ11-14 - Total score
MIQ-AR					
Correlation Coefficient	-0.091	0.212	0.320**	0.388**	0.597**
Sig. (2-tailed)	0.430	0.064	0.005	0.000	0.000

**Correlation is significant at the 0.01 level (2-tailed). MIQ-AR: Malocclusion Impact Questionnaire-Arabic; CPQ11-14: Child Perception Questionnaire for 11-14 year olds

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