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Validity and reliability of the Arabic translation of the child oral-health-related quality of life questionnaire ($CPQ_{11–14}$) in Saudi Arabia

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Summary. *Aim*. The purpose of this study was to test the validity and reliability of an Arabic translation and adaptation of the child oral-health-related quality of life questionnaire ($CPQ_{11–14}$) in Saudi Arabia.

Design. The modified questionnaire included two global ratings (oral health and oral-health-related well-being), and a battery of 36 questions in four domains (oral symptoms, functional limitations, emotional well-being and social well-being). The study population consisted of 174, 11–14-year-old children (65% healthy and 35% medically compromised). Clinical data on caries status and malocclusion were collected for 138 of the children, and 47 completed the questionnaire a second time.

Results. There was a significant difference in mean total scale scores between children with and without malocclusions ($P < 0{\cdot}05$). Significant relationships were identified between caries status and oral symptoms subscale scores, and between malocclusion and total scale and social well-being subscale scores ($P < 0{\cdot}05$). Correlation was highly significant between scale scores and global ratings ($P < 0{\cdot}01$). Cronbach's alpha was 0·81 and the test–retest reliability was substantial ($r = 0{\cdot}65$, $P < 0{\cdot}001$). However, problems were encountered in Saudi Arabia regarding self-reporting of age, and the questionnaire was too long for many of the medically compromised patients.

Conclusions. The questionnaire is valid and reliable for use in Saudi Arabia, although development of a shorter version is recommended.

Introduction

Oral health has been defined as the standard of health of oral and related tissues that enables individuals to eat, speak and socialize without active disease, discomfort or embarrassment, and that contributes to general well-being [1]. Quality of life (QoL) measures have been developed to assist in evaluating both the physical and psychosocial impact of oral health. These are an attempt to quantify the extent to which dental and oral disorders interfere with daily life.

Dental caries is the most common chronic disease of childhood. The World Health Organization has estimated that 60–90% of all school-age children are affected [2,3]. In the USA, dental caries is responsible for more than 3·1 days absence per 100 students per year [4]. However, in a tertiary care hospital paediatric patient population, additional oral conditions are frequently encountered, such as cleft lip and palate, syndromes and diseases with oral manifestations, oral complications of medical therapies, and injuries. The resulting pain, infection, functional restrictions and embarrassment about appearance may not only have an adverse effect on these children's school performance, but also on their social relationships, emotional well-being, and very importantly, on their disease management. Measurement of functionality and QoL, together with self-reports of symptoms and overall health status, are fundamental to evaluation of treatment process and outcome. Therefore, the ability to assess these factors with respect to oral condition will assist in identifying ways to improve medically compromised children's dental, as well as medical, care.

Cultural norms and expectations influence children's perception of their oral health and its effect on their

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QoL. In communities where oral problems are widespread, it is possible that self-assessment differs from that in communities where oral health status and opportunities for treatment are better. Most oral-health-related QoL measurement tools, particularly those for children, have been developed in either North America or Europe [5–7]. A few child questionnaires have been validated elsewhere [8–11], but only two after translation into another language [10,12]. None had been translated into Arabic and tested in the Middle East.

Therefore, the aim of this study was to assess the validity and reliability of the Arabic translation of an English-language child oral-health-related QoL questionnaire for 11–14-year-olds in Saudi Arabia. King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia, provided an ideal setting. Over 5000 children a year are treated in the Dental Clinic, about half of whom are medically compromised. Thus, there was a good cross-section of patients passing through the clinic, covering a broad range of oral and medical conditions. Furthermore, many of the children had frequent appointments which enabled retesting.

Subjects and methods

Study population

For the duration of the study, every 11–14-year-old child with an appointment in the KFSH&RC Dental Clinic who was intellectually and physically capable of completing the questionnaire unaided, and agreeing to participate, was included.

Development of the questionnaire

The English-language self-complete questionnaire to determine frequency of various oral-health-related impacts in 11–14-year-olds ($CPQ_{11–14}$) was developed and validated in Toronto, Canada [6]. It was translated into Arabic, professionally revised twice and translated back into English for verification.

The original questionnaire contained a battery of 41 questions. The first two collected demographic details (sex and date of birth). The third and fourth asked the children for a global rating of their oral health (excellent, very good, good, acceptable or bad) and the extent to which their oral health affected their overall well-being (not at all, very little, somewhat, a lot or very much). The responses were scored as follows: for global rating of oral health, (0) excellent, (1) very good, (2) good, (3) acceptable and (4) bad; and for overall well-being, (0) not at all, (1) very little, (2) somewhat, (3) a lot and (4) very much.

The remaining questions were divided into four health domains: oral symptoms ($n = 6$); functional limitations ($n = 9$); emotional well-being ($n = 9$); and social well-being ($n = 13$). These were designed to extract more detailed information about how frequently in the previous 3 months the children had experienced specific impacts because of problems with their teeth, gums or mouth. Having reviewed the questions, the investigators at KFSH&RC decided to remove one from the last group that asked how often the children encountered difficulties playing a musical instrument because Saudi children rarely study music. Otherwise, the questions were the same as those used in the original English-language version. The Arabic translation of the global and $CPQ_{11–14}$ scale questions is provided in Fig. 1.

Each response was scored as follows: (0) never; (1) once/twice; (2) sometimes; (3) often; and (4) every day/almost every day. The sum of the response code scores for the 36 questions gave an overall evaluation of the extent to which each child's oral condition affected her or his QoL. Since there were 36 questions, the highest possible score for the total scale was 144, and the lowest, 0. The sum of the response codes for questions in each subscale gave a total score for each domain.

Administration of the questionnaire

The children were requested to complete the questionnaire themselves, without asking their parents or siblings for assistance. If participation by others was observed, the questionnaire was discarded. To quantify test–retest reliability, the first 51 children with follow-up appointments in the dental clinic within a month of the recruitment date were asked to complete the questionnaire a second time. The children's dental records were reviewed to ensure that their oral health had not changed since the previous visit.

Extraction of clinical data

One of the investigators (A.B.) reviewed 154 of the children's medical records to establish their medical and dental condition on the day of recruitment. All the children had current bitewing and panoramic radiographs, dental charts and treatment plans, and medical histories. Caries status was quantified using the decayed,

إلى أي مدى تؤثر حالة أسنانك، وشفتيك، وفمك، وفكّيك على حياتك بشكل عام؟
خلال الأشهر الثلاثة الماضية .... هل عانيت من:
١ .ألم في أسنانك، أو شفتيك ، أو فكيك، أو فمك؟
٢. نزيف باللثة؟
٣. تقرحات في فمك؟
٤. رائحة نفَس غير مستحبة (كريهة)؟
٥. طعام عالق داخل أسنانك أو بينها؟
٦. طعام عالق بأعلى فمك؟
٧. تنفست من خلال فمك؟
٨. استغرقت وقتاً أطول من الآخرين لتناول وجبتك؟
٩.اجهت صعوبات في النوم؟
١٠. صعوبة في عض أو مضغ أطعمة مثل التفاح، عرنوس ذرة، أوقطع اللحم؟
١١. صعوبة في فتح الفم على سعته؟
١٢. صعوبة في نطق أي كلمة؟
١٣. صعوبة في تناول الأطعمة التي تحبها؟
١٤. صعوبة في الشرب بواسطة الشفاط؟
١٥. صعوبة شرب أوتناول الأطعمة الساخنة أو الباردة؟
١٦. سرعة الانفعال أو الإحباط؟
١٧. عدم الثقة في النفس؟
١٨. الخجل أوالإحراج؟
١٩. القلق من رأي الآخرين حيال أسنانك؟
٢٠. القلق بأنك لست جيد المظهر أو مقبول الشكل كالآخرين؟
٢١. الانزعاج؟
٢٢. التوتر أو الخوف؟
٢٣. القلق بأنك لست معافى صحياً كالآخرين؟
٢٤. القلق بأنك مختلف عن الآخرين؟
٢٥. التغيب عن المدرسة بسبب ألم، أو موعد، أوعملية جراحية؟
٢٦. أي صعوبة في الانتباه في المدرسة؟
٢٧. أي صعوبة في أداء الواجبات المنزلية؟
٢٨. عدم الرغبة في الكلام أو القراءة بصوت عال في الصف؟
٢٩. تجنبت المشاركة في أنشطة مثل الرياضة ، أو النوادي ، أو التمثيل ، أو الموسيقى، أو الرحلات المدرسية؟
٣٠. تجنبت التحدث مع الأطفال الآخرين؟
٣١. تجنبت الابتسام أو الضحك عندما كنت بصحبة غيرك من الأطفال؟
٣٢. رغبت عن قضاء بعض الوقت مع أطفال آخرين؟
٣٣. تخاصمت مع أطفال آخرين أو مع عائلتك؟
٣٤. أغاظك أو سخر منك أطفال آخرون، أو نادوك بألقاب غير محببة؟
٣٥. أشعرك أطفال آخرون بالانعزال أو الوحدة؟
٣٦. وجه إليك أطفال آخرون أسئلة عن أسنانك، أو شفتيك، أو فكيك، أو فمك؟

Fig. 1. Arabic global and CPQ$_{11-14}$ scale questions.

missing and filled teeth (DMFT) index. The DMFT score for each subject was the sum of the permanent teeth decayed (DT), missing (MT) and filled (FT). Permanent teeth extracted for orthodontic reasons, congenitally absent, unerupted or lost as the result of trauma were not included. Malocclusion was scored as follows: (0) none (little or no treatment required); (1) slight (moderate or borderline treatment required); and (2) moderate or severe (treatment required or active).

Statistical evaluation

Any questionnaire with more than two questions unanswered in any one domain was excluded from the statistical analysis. The SPSS statistical computer software (Version 10·0, SPSS Inc., Chicago, IL, USA) was used to calculate the following: means, standard deviations (SDs), ranges and frequencies for the total scale and subscale (domain) scores.

Discriminant validity was tested first by comparing total scale and subscale scores for children with no malocclusion (score = 0), and those with a moderate or severe malocclusion (score = 2), using the independent samples *t*-test. Secondly, the association between DMFT and malocclusion scores, and total and subscale scores was calculated for the whole patient population using Spearman's rank correlation coefficient.

Construct validity was determined by establishing the association between the scores for the total scale and each domain, with the children's global ratings of oral health and overall well-being using Spearman's rank correlation coefficient. To test a significant value for a validity index of 0·4 or more, with a Type 1 error rate of 5% and a power of 80%, the estimated sample size was 47 subjects [13].

Test–retest reliability was assessed by finding the level of association between scores for the first and second total scale and domain scores of children who completed the questionnaire twice. Reliability is the proportion of score variance attributable to true differences between patients whose health status is stable over time [14]. Sample size calculations, based on a hypothesized value of intraclass correlation of over 80% and two repeats, showed that the minimum number of subjects needed was 40 [15].

All the statistical tests were repeated after excluding the medically compromised children from the study population to investigate whether medical status had influenced the results.

Ethical considerations

The study was approved by the Research Advisory and Research Ethics Committees of the KFSH&RC. Parents were asked to sign an informed consent form before their child was recruited for the study. The children's verbal assent was also obtained and documented.

Results

In total, 190 children completed the questionnaire once, and 51 for a second time. Nine (12·9%) of the medically compromised and seven (5·8%) of the healthy children's questionnaires were excluded from the analysis because more than two questions were unanswered in one of the domains. Therefore, the study population consisted of 174 children. Seventy-nine (45·4%) were boys and 95 (54·6%) girls; 113 (64·9%) were healthy and 61 (35·1%) medically compromised. Normative oral health assessments were available for 138 of these, and retests for 47.

Before exclusion of the 16 questionnaires, item response rates ranged from 97·9% to 100% for oral symptoms, 98·4% to 100% for functional limitations, 93·2% to 98·4% for emotional well-being and 94·7% to 100% for social well-being.

The scores for the total scale in the study population ranged from 0 to 102, with a mean of 24·22 (SD = 17·14). 92·5% of the children reported experiencing oral symptoms during the previous 3 months and 90·2% functional limitations. Fewer reported emotional (77·0%) and social (79·3%) impacts.

There was a significant difference at the 0·05 level in mean scores for the total, and functional limitations and social well-being subscales between the children without malocclusions (score = 0), and those with moderate or severe malocclusions (score = 2) (Table 1). The correlation between DMFT and the oral symptoms subscale was significant

Table 1. Discriminant validity: overall and subscale scores for children with no malocclusion, and patients with moderate or severe malocclusion (treatment required or active), with significance of difference in means.

	Score (mean ± SD)		
Variable	No malocclusion (n = 40)	Moderate or severe malocclusion (n = 76)	P-value*
Total scale	17·38 ± 12·71	25·38 ± 17·58	0·012
Subscales			
Oral symptoms	4·75 ± 3·34	5·18 ± 3·44	0·515
Functional limitations	4·65 ± 4·28	6·80 ± 5·28	0·028
Emotional well-being	4·00 ± 4·18	6·07 ± 5·92	0·052
Social well-being	3·98 ± 4·85	7·29 ± 7·32	0·004

*Using independent samples *t*-test.

Table 2. Discriminant validity: rank correlations between decayed, missing, filled teeth (DMFT) and malocclusion index scores, and overall and subscale scores ($n = 138$).

	Score			
	DMFT		Malocclusion	
Variable	r*	P-value	r*	P-value
Total scale	0·166	0·052	0·198	0·020
Subscales				
Oral symptoms	0·192	0·024	0·031	0·718
Functional limitations	0·116	0·177	0·153	0·074
Emotional well-being	0·141	0·100	0·132	0·124
Social well-being	0·044	0·609	0·224	0·008

*Spearman's correlation coefficient.

($P < 0·05$). Malocclusion scores were significantly associated with the total scale ($P < 0·05$) and social well-being subscale ($P < 0·01$) (Table 2).

As an index of construct validity, Spearman's correlation was highly significant at the 0·01 level with both global indicators for the total scale (r = 0·43 and 0·27), oral symptoms (r = 0·37 and 0·24), functional limitations (r = 0·36 and 0·25) and emotional well-being (r = 0·35 and 0·24). Social well-being was significantly associated only with global rating of oral health (r = 0·23), but not overall well-being. The results are shown in Table 3.

Cronbach's alpha was 0·81 for the total scale, and ranged from 0·65 for emotional well-being to 0·88 for social well-being, indicating acceptable internal consistency. Test–retest reliability was substantial. The intraclass correlation coefficient was 0·65 for the total scale, and 0·62 for oral symptoms, 0·60 for functional limitations, 0·45 for emotional well-being and 0·76 for social well-being subscales ($P < 0·001$) (Table 4).

Table 3. Construct validity: rank correlations between total scale and subscale scores, and global ratings of oral health and overall well-being ($n = 174$).

	Global rating			
	Oral health		Overall well-being	
Variable	r*	P-value	r*	P-value
Total scale	0·429	< 0·0001	0·268	< 0·0001
Subscales				
Oral symptoms	0·372	< 0·0001	0·236	0·002
Functional limitations	0·362	< 0·0001	0·251	0·001
Emotional well-being	0·345	< 0·0001	0·243	0·001
Social well-being	0·228	0·002	0·101	0·188

*Spearman's correlation coefficient.

Table 4. Reliability statistics for total scale and subscales ($n = 47$): (95% CI) 95% confidence interval.

Variable	Number of items	Cronbach's alpha	Intraclass correlation coefficient (95% CI)*
Total scale	36	0·81	0·65 (0·45–0·79)
Subscales			
Oral symptoms	6	0·76	0·62 (0·40–0·77)
Functional limitations	9	0·77	0·60 (0·39–0·76)
Emotional well-being	9	0·65	0·45 (0·19–0·65)
Social well-being	12	0·88	0·76 (0·61–0·86)

*One-way random effect model: $P < 0·001$ for all values.

When the statistical tests were repeated without the data from the medically compromised children, the results were very similar. Mean scale scores were slightly lower and the significance of the difference in means less strong, but construct validity and test–retest reliability were almost the same.

Discussion

This study established the acceptable validity and reliability of the Arabic translation of the CPQ$_{11–14}$ questionnaire for use in Saudi Arabia. However, a few problems were encountered with its administration in this patient population.

Initially, question 2 asked the children to write their date of birth, which caused a certain amount of confusion as some wrote down the Hijjra and some the Gregorian date. Therefore, the wording was changed to 'How old are you?', but even this proved problematic. Not infrequently, the age given on the questionnaire did not match that in the hospital computer database. It was thought that many were writing their Hijjra age, or possibly, the hospital information was inaccurate. Therefore, if one wished to use the questionnaire for a population-based survey, another method would need to be sought for verifying the respondents' ages. In a hospital or school setting, official records could be used.

There was missing data on some of the questionnaires, more often on those completed by the medically compromised children. It became obvious very early on in the study that many of these children had difficulty reading and/or understanding the questions. It was suspected that quite a few asked their parents for help, which probably influenced the replies, although no data was entered from any questionnaire when parental participation had been observed. Some

of the medically compromised children were not in school, and therefore, unable to answer several questions. Furthermore, they generally found the questionnaire too long. Nevertheless, the results of the statistical tests after exclusion of the medically compromised children's questionnaire data suggested that, so long as they could complete it themselves, the validity and reliability of the questionnaire in this population are satisfactory irrespective of medical status.

However, to allow assessment of the oral-health-related QoL of a wider range of children in a hospital setting, a shorter and simpler version will be developed next. Item impact and stepwise regression methods will be used to select four items from each domain according to the process described by Jokovic *et al*. [16]. The resulting questionnaires will then be tested on healthy and medically compromised clinic patients to select the most suitable tool for use at KFSH&RC.

It has also been suggested that a trained interviewer could administer the questionnaire. This would enable evaluation of oral-health-related QoL, whatever a child's reading ability, and remove the possibility of parental influence. It would also be interesting to compare the effect of different modes of administration on the validity and reliability of the questionnaire in this patient population.

Exact comparison between the results of the Saudi and Canadian studies was not possible because of the exclusion of one question in the Arabic questionnaire, and the use of different indices to evaluate caries status and malocclusion. Nonetheless, the indication was that validity and reliability were similar.

In both studies, there was a significant difference in mean scores for the total scale between children with and without malocclusions. A strong correlation was observed in the Canadian paedodontic patients between the number of decayed tooth surfaces and overall scale scores. On the other hand, the Saudi study looked for an association between the DMFT and scale scores for all children, and a relationship could only be demonstrated between DMFT and oral symptoms subscale. The questionnaire has also been tested in the United Kingdom using the DMFT to quantify caries status. There, the investigators were unable to find any association between DMFT and $CPQ_{11–14}$ scores [17]. Because evaluation of QoL is so strongly influenced by personality and standards of reference, poor correlation between clinical ratings and health-related QoL scores is not unusual [18].

Construct validity of the $CPQ_{11–14}$ Arabic translation was good. Significant correlations were shown between global rating of oral health and the total scale and all subscales, whereas the Canadian study observed correlations only between the total, oral symptom and emotional well-being domain scores. On the other hand, the Saudi study failed to show any correlation between global rating of overall well-being and social well-being while the Canadian study established significant associations with all subscales. Research has suggested that global self-rating of health items varies by race and education [19]. Translating and adapting a questionnaire developed in one country for use in another is not always successful [20]. Semantics differ, as well as expectations and norms. Nevertheless, the Arabic translation of the $CPQ_{11–14}$ appears to be valid for use in Saudi Arabia.

The test–retest reliability for the Arabic translation was substantial (0·65, $P < 0·001$), but not as strong as that found for the English-language questionnaire (0·90, $P < 0·001$). The Canadian study had the children fill in the questionnaire a second time exactly 2 weeks later, but this was not feasible in Saudi Arabia. The response rate for retests would have been extremely low if the children had been relied on to complete it at home and then mail to the hospital. Therefore, a compromise arrangement was devised by which the children were asked to do the retest at their next appointment. As a result, the time between filling in first and second questionnaires was very variable, and the children who took the retest one month later were recalling a different 3-month period the second time.

In addition, the investigators decided to rely on a review of the children's dental records to ensure that their oral health had not changed between the test and retest. This introduced a further weakness in the evaluation of reliability. When assessing the short-form measure, a question will be included in the second questionnaire asking the children whether they themselves feel that their oral health has changed since the previous administration. A strategy will also be developed to standardize the time between completions of the test and retest.

The Arabic used in the translated questionnaire is that taught in school throughout the Middle East. While the spoken language varies between regions and countries, the written language is universal. An Arabic version of the adult oral-health-related QoL measure (OHQoL-UK) was found to have satisfactory construct validity, criterion validity and internal reliability in Syria, Egypt and Saudi Arabia [21]. It is hoped this adaptation of the $CPQ_{11–14}$ will also prove to be useful in other Middle-Eastern countries.

In conclusion, the Arabic translation and modification of the $CPQ_{11–14}$ questionnaire showed acceptable validity and reliability in a hospital-based dental clinic population in Saudi Arabia. It now remains to pilot it in a wider, non-hospital environment and develop a shorter version.

What this paper adds

- This paper shows that an Arabic translation and modification of the $CPQ_{11–14}$ questionnaire is valid and reliable for use in a hospital-based dental clinic population in Saudi Arabia.

Why this paper is important to paediatric dentists

- Paediatric dentists working elsewhere in Saudi Arabia and other Arabic-speaking countries will be able to use this questionnaire for assessing the impact of oral health on the quality of their patients.
- QoL measures developed in English-speaking countries are often valid and reliable for use in other countries after translation.

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