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ORIGINAL ARTICLE

Assessing change in the family impact of caries in young children after treatment under general anaesthesia

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Abstract

Objective. To examine the properties, validity and responsiveness of the Family Impact Scale in a consecutive clinical sample of patients undergoing dental treatment under general anaesthesia. ***Materials and methods.*** A consecutive clinical sample of parents/caregivers of children receiving dental treatment under general anaesthesia provided data using the Family Impact Scale (FIS) component of the COHQOL© Questionnaire. The first questionnaire was completed before treatment, the follow-up questionnaire 1–4 weeks afterward. Treatment-associated changes in the FIS and its components were determined by comparing baseline and follow-up data. ***Results.*** Baseline and follow-up data were obtained for 202 and 130 participants, respectively (64.4% follow-up). All FIS items showed large relative decreases in prevalence, the greatest seen in those relating to having sleep disrupted, blaming others, being upset, the child requiring more attention, financial difficulties and having to take time off work. Factor analysis largely confirmed the underlying factor structure, with three sub-scales (*parental/family, parental emotions* and *family conflict*) identified. The *parental/family* and *parental emotions* sub-scales showed the greatest treatment-associated improvement, with large effect sizes. There was a moderate improvement in scores on the *family conflict* sub-scale. The overall FIS showed a large improvement. ***Conclusion.*** Treating children with severe caries under general anaesthesia results in OHRQoL improvements for the family. Severe dental caries is not merely a restorative and preventive challenge for those who treat children; it has far-reaching effects on those who share the household and care for the affected child.

Key Words: *Dental care for children, quality of life, dental caries, anaesthesia, general, anaesthesia, dental*

Introduction

Considerable research work in the last two decades has focused upon the development and validation of measures of oral-health-related quality-of-life (OHRQoL) [1]. The early years of those efforts saw the emergence of scales for use among older people [2]; these were subsequently validated for use with younger adults and even adolescents [3]. The last decade has seen the development and testing of OHRQoL measures for children, with the COHQOL and its various age-specific questionnaires [4] arising from that work. These research efforts with both adult- and child-focused measures have resulted in growing acceptance of both the concepts and the instruments, with the use of OHRQoL measurements becoming more common, particularly in dental epidemiological and health services research. Health services research (HSR) is the field where such measures have perhaps the most potential, particularly in determining whether therapeutic interventions actually do improve patients' lives.

Using the COHQOL, we recently reported substantial improvements in OHRQoL among a consecutive clinical sample of New Zealand children undergoing dental treatment under general anaesthesia [5]. There were marked improvements in scores on the four sub-scales (oral symptoms, functional limitations, emotional well-being and social well-being) upon follow-up. Of particular interest was the observed large reduction in scores on the Family Impact Scale component of the COHQOL, suggesting strongly that treating the child's problems resulted in improvements for the household as well. This

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finding supported and built upon those from an earlier New Zealand study [6], where marked reductions were observed in the prevalence of parental sleep disruption and the child needing more parental attention. Earlier studies have also reported improvements in aspects of children's lives after treatment for dental caries under general anaesthesia [7–9], but none had used a validated scale for doing so.

The aim of this study was to more closely examine the properties, validity and responsiveness of the Family Impact Scale component of the COHQOL in a consecutive clinical sample of patients undergoing dental treatment under general anaesthesia, in order to gain greater understanding of this promising measure.

Materials and methods

In February 2005, the Central Regional Ethics Committee gave ethical approval for the study. The participants were a consecutive clinical convenience sample of the parents/caregivers of children receiving dental treatment under general anaesthetic at Wellington and Kenepuru hospitals at any time during the 5-month period of March–July 2005. Children receiving dental treatment at these hospitals reside in Wellington, Porirua, the Hutt Valley, the Kapiti Coast or Wairarapa. All of the parents/caregivers of children receiving dental treatment under GA were invited to participate in the study, but those who could not speak or read English fluently were included only if a suitable interpreter was present. Information regarding the study was given to potential participants in the form of a written covering letter/information sheet, with further verbal information being provided by the hospital dentist if necessary. Written consent was obtained.

Self-administered questionnaires were used to collect the data. The first was completed by the parent/caregiver while the child was undergoing the operation. The follow-up questionnaire was given to parents/caregivers to complete at the child's post-operative review appointment; this typically occurred 1–3 weeks after the operation. If the family failed to attend the post-operative review appointment (or if one had not been required), the questionnaire was mailed to them 1–3 weeks afterward (with a self-addressed and postage-paid envelope). If this had not been returned within 1 month, a second copy was then mailed and a reminder telephone call was made. No questionnaires were administered by telephone interview.

Standard sociodemographic data on the participants and their children were collected, including the child's gender, age and ethnic group (European, Māori, Samoan, Other Pacific Islanders or Other). Data on the age of the child were collected in months and used to allocate the children across the three groups of 'Pre-school' (less than 5 years old), 'Early school' (5- and 6-year-olds) and 'Older' (7 years old and older). Families were categorized using an area-based socio-economic status (SES) measure, the NZDep2001 [10], which assigns deprivation scores to Census meshblocks, which are the smallest geographic area used by Statistics New Zealand in the collection and analysis of data. The median number of individuals per meshblock during the 2001 Census was 87. The NZDep2001 index combines nine variables from the 2001 Census which reflect aspects of both material and social deprivation. An individual's area-based SES is then determined by geocoding the residential address, with the assigned SES being the score for the meshblock in which he/she resides. Once obtained, the data were recoded into the three groups of 'High deprivation' (scores 1–3), 'Medium deprivation' (scores 4–7)' and 'Low deprivation' (scores 8–10).

The impact of the child's condition upon the family was measured using the 14-item Family Impact Scale (FIS; Table I), a component of the COHQOL© questionnaire [11,12]. The questionnaires were obtained in November 2004 from www.cdhsru-uoft.ca/cohqol. The family impact section of the questionnaire was introduced with the sentence: 'The following questions ask about effects that your child's oral condition may have on parents and other family members'. The 14 items sought information on the frequency of impacts; for example, the baseline questionnaire asked 'In the past 3 months, because of your child's teeth, lips, mouth or jaws, how often have you or another family member had sleep disrupted?', while the follow-up questionnaire asked 'Since the operation to fix your child's teeth . . . how often have you or another family member had sleep disrupted?' These were scored using a 5-point Likert scale (response options: 'Never' = 0; 'Once or twice' = 1; 'Sometimes' = 2; 'Often' = 3; 'Every day or almost every day' = 4). A 'Don't know' response option was also provided and scored as 0; this prevents the loss of valuable information which would occur if complete data from participants with non-response to some items was deleted.

Statistical analyses

After the computation of univariate statistics, changes in the prevalence of impacts were determined for each item making up the FIS by comparing the proportion responding 'Sometimes', 'Often' or 'Every day' before and after treatment, with the McNemar test used to determine the statistical significance ($p < 0.05$) of any observed changes.

Confirmatory factor analysis was used (using principal components analysis with varimax rotation) to confirm the underlying factor structure of the Family Impact Scale items and the three sub-scales.

Table I. Before- and after-treatment prevalence of individual item impacts ‘Sometimes’, ‘Often’ or ‘Every day or almost every day’.

Family Impact Scale items	Before treatment	After treatment	Relative change in prevalence[a]
Been upset	63 (48.5%)	13 (10.0%)[b]	−79.4%
Had sleep disrupted	53 (40.8%)	9 (6.9%)[b]	−83.1%
Felt guilty	70 (53.8%)	31 (23.8%)[b]	−55.8%
Taken time off work	30 (23.1%)	8 (6.2%)[b]	−73.2%
Had less time for self or the family	29 (22.3%)	8 (6.2%)[b]	−72.2%
Worried that child will have fewer life opportunities	9 (6.9%)	3 (2.3%)	−66.7%
Felt uncomfortable in public places with your child	6 (4.6%)	3 (2.3%)	−50.0%
Been jealous of you or others in the family	6 (4.6%)	0 (0.0%)	−100.0%
Blamed you or another person in the family	22 (16.9%)	4 (3.1%)[b]	−81.7%
Argued with you or others in the family	18 (13.8%)	7 (5.4%)[b]	−60.9%
Required more attention from you or others in the family	40 (30.8%)	12 (9.2%)[b]	−77.6%
Interfered with family activities at home or elsewhere	22 (16.9%)	8 (6.2%)[b]	−63.3%
Caused disagreement or conflict in the family	13 (10.1%)	5 (3.8%)	−62.4%
Caused financial difficulties for the family	13 (10.1%)	3 (2.3%)[b]	−77.2%

[a] Calculated by dividing the change in prevalence by the baseline prevalence and expressing it as a percentage.
[b] $p < 0.05$; McNemar test.

Cronbach’s α was used to determine the internal reliability of the sub-scales.

Scores from the 14 FIS items on the impacts of the child’s oral condition on parents and other family members were summed to create an overall *family impact scale* (FIS) score. The three sub-scales described in the original report on the FIS [12] were created by summing response scores for the appropriate items. These sub-scales were the *parental/family activity* sub-scale (five items), the *parental emotions* sub-scale (four items) and the *family conflict* sub-scale (four items).

Mean before- and after-treatment scores were computed for each of the sub-scales and the mean change in score for each was calculated by subtracting the post-treatment score from the pre-treatment score (meaning that a positive change score indicated an improvement in OHRQoL and a negative change score indicated a deterioration). A Wilcoxon test was used to test the statistical significance of the change and its clinical significance was determined by calculating an effect size (by dividing the mean change score by the standard deviation of the pre-treatment scores), in order to give a dimensionless measure of effect. Effect size statistics of less than 0.2 indicate a small clinically meaningful magnitude of change, 0.2–0.7 a moderate change and greater than 0.7 a large change.

Results

The parents/caregivers of 214 children were recruited during the study period (204 from Kenepuru Hospital and 10 from Wellington Hospital). Of those, six were excluded: four questionnaires contained many incomplete items; one was removed because the child received only an oral examination under GA and did not require any dental treatment; and one child experienced an adverse anaesthetic incident. This left a total of 208 for whom baseline data were collected and complete data (that is, without any item non-response) were available for 202 (97.1%) of those. Follow-up questionnaires were obtained for 138 (66.3%) of the baseline respondents. Complete baseline and follow-up data were available for 130 (94.2%) of these, representing 64.4% of the sample for whom complete baseline data were available.

The ages of those children ranged from 30 to 181 months (2.5–15.1 years) and 60.0% were younger than 6 years old. A high proportion of the questionnaires were completed by mothers of the children. Mothers completed 167 (83.8%) and 108 (83.1%) of the baseline questionnaires and follow-up questionnaires, respectively, while fathers completed 29 (13.8%) and 17 (13.1%), respectively. Family members other than parents completed eight (3.8%) and four (3.1%) questionnaires, respectively, while other informants completed two (1.0%) and one (0.8%); data on the informant were missing for two children. For 103 children (79.2% of those followed up), both questionnaires were completed by the mother, while both were completed by the father for 12 children (9.2%). For 12 children (9.2%), different individuals completed the baseline and follow-up questionnaires (and there were no significant differences between them and the remainder of the sample with respect to either baseline or follow-up scale scores).

The sociodemographic characteristics of the sample at baseline and those for whom follow-up questionnaires were completed are compared in Table II. Males slightly outnumbered females at both baseline and follow-up, while Māori or Pacific Island children accounted for approximately half of the sample. More Samoan and Other Pacific Island children were lost to follow-up than from the other ethnic groups, but this difference was not statistically significant.

Data on the prevalence of individual item impacts before and after treatment are presented in Table I. All items showed large relative decreases in prevalence, but for items did not show statistically significant decreases. Among the others, the greatest decreases were seen in the items relating to having sleep disrupted, blaming others, being upset, the child requiring more attention, financial difficulties and having to take time off work.

The outcome of the confirmatory factor analysis is presented in Table III. All five items in the *parental/family activity* sub-scale showed strong loadings and high internal reliability; this was also true for the *family conflict* sub-scale. However, two of the items in the *parental emotions* sub-scale failed to load; these were 'Worried that child will have fewer life opportunities' and 'Felt uncomfortable in public places with your child'. The internal reliability of that sub-scale was relatively low.

Before- and after-treatment scores for the three sub-scales are presented in Table IV, together with change scores and effect sizes. While all three sub-scales showed decreases in mean score associated with treatment, the *parental/family* and *parental emotions* sub-scales showed the greatest improvement, with large effect sizes. There was a moderate improvement in scores on the *family conflict* sub-scale. The overall FIS showed a large improvement. There were no sociodemographic differences in scale scores or changes (data not presented but available on request).

Discussion

This study set out to more closely examine the properties, validity and responsiveness of the Family Impact Scale (FIS) component of the COHQOL in a consecutive clinical sample of patients undergoing dental treatment under general anaesthesia. It found that all individual items showed decreases in prevalence (with most being statistically significant). The underlying three-factor structure of the FIS was largely confirmed, although there were some inconsistencies with the *parental emotions* sub-scale. Mean scores on all three sub-scales showed large or moderate decreases (indicating improved OHRQoL) following treatment under general anaesthesia.

Before any discussion of the findings from this intervention study using a consecutive clinical sample, it is appropriate to consider the size, retention and representativeness of the sample. Taking a

Table II. Baseline sociodemographic characteristics of children by follow-up status.

	Baseline sample	Followed up	Lost to follow-up
Gender			
Female	95 (47.0%)	63 (48.5%)	32 (44.4%)
Male	107 (53.0%)	67 (51.5%)	40 (55.6%)
Ethnicity			
European	78 (38.6%)	54 (41.5%)	24 (33.3%)
Māori	55 (27.2%)	37 (28.5%)	18 (25.0%)
Samoan	36 (17.8%)	18 (13.8%)	18 (25.0%)
Other Pacific Island	16 (7.9%)	9 (6.9%)	7 (9.7%)
Other	17 (8.4%)	12 (9.2%)	5 (6.9%)
Deprivation category[a]			
High	81 (40.3%)	47 (36.2%)	34 (47.9%)
Medium	68 (33.8%)	44 (33.8%)	24 (33.8%)
Low	52 (25.9%)	39 (30.0%)	13 (18.3%)
Age group (months)			
Pre-school (0–4 years)	80 (39.6%)	49 (37.7%)	31 (43.1%)
Early-school (5–6 years)	77 (38.1%)	50 (38.5%)	27 (37.5%)
Older (7 years and older)	45 (22.3%)	31 (23.8%)	14 (19.4%)
Mean age in months (SD)	70.2 (25.4)	71.6 (26.2)	67.7 (22.5)
Total	202 (100.0%)	130 (64.4%)	72 (35.6%)

[a] Data missing for one individual.

Table III. Outcome of confirmatory factor analyses of baseline Family Impact Scale data (CFA for each sub-scale undertaken separately).

	Factor 1	Factor 2	Factor 3
Parental/family activity[a]			
Taken time off work	0.632		
Required more attention from you or others in the family	0.815		
Had less time for self or the family	0.798		
Had sleep disrupted	0.746		
Interfered with family activities at home or elsewhere	0.805		
Parental emotions[b]			
Been upset		0.869	
Felt guilty		0.889	
Worried that child will have fewer life opportunities		−0.025	
Felt uncomfortable in public places with your child		0.175	
Family conflict[c]			
Argued with you or others in the family			0.871
Been jealous of you or others in the family			0.650
Caused disagreement or conflict in the family			0.792
Blamed you or another person in the family			0.799

[a] Only one factor extracted, so unrotated solution presented: total variance explained = 58.1%; eigenvalue = 2.9; Cronbach's $\alpha = 0.82$.
[b] Rotated solution presented: total variance explained = 43.9%; eigenvalue = 1.8; Cronbach's $\alpha = 0.56$.
[c] Only one factor extracted, so unrotated solution presented: total variance explained = 61.2%; eigenvalue = 2.4; Cronbach's $\alpha = 0.79$.

consecutive sample of cases presenting for treatment under GA over a set period resulted in the number of participants at baseline ($n = 208$) being substantially greater than almost all of the previous studies in this field [6] and the number assessed at follow-up ($n = 130$) was also higher. The 64% follow-up rate is satisfactory, comparing favourably with previous studies, and the data in Table II suggest that the sample attrition occurred more or less at random, with no systematic differences between those who were retained and those who were lost to follow-up, as there were no statistically significant differences between those groups in their baseline characteristics. The consecutive nature of the sample suggests that the group for whom there are complete data should be representative of children who undergo dental treatment under GA in the greater Wellington area.

The findings of this study build on those we reported earlier [5] by examining more closely the changes in the FIS and its sub-scales. Scrutiny of changes in the individual items revealed that almost all showed statistically significant decreases in prevalence and that those which did not were mostly the items with low baseline prevalence. The treatment under general anaesthesia of children with severe dental caries results in improvements in OHRQoL not only at the child level, as we have previously reported [5], but also for the family, for whom the improvements are detectable at overall FIS level and at the level of the individual items which make up the FIS. Among the latter, there were particularly large improvements in the items relating to having sleep disrupted, blaming others, being upset, the child requiring more attention, financial difficulties and having to take time off work. These are important and most likely welcome changes for the families of the children in this consecutive clinical sample and they underline the point that severe dental caries is not merely a restorative and preventive challenge for those who treat children; it has far-reaching effects on those

Table IV. Before and after FIS sub-scale and overall scale scores, with effect sizes.

	Mean score (SD)			
	Baseline	Post-treatment	Change	Effect size
Parental/family activity sub-scale	4.63 (3.93)	1.70 (2.24)[a]	2.93 (3.7)	0.75 ('Large')
Parental emotions sub-scale	3.51 (2.48)	1.54 (1.75)[a]	1.97 (2.58)	0.79 ('Large')
Family conflict sub-scale	1.61 (2.45)	0.62 (1.31)[a]	0.99 (2.25)	0.40 ('Moderate')
Overall *Family Impact Scale*	10.12 (8.06)	3.98 (4.41)[a]	6.19 (7.51)	0.76 ('Large')

[a] $p < 0.001$ for change in scale score (Wilcoxon test).

who share the household and care for the affected child.

There is, of course, the possibility that at least some of the observed changes were due to participants giving positive responses in gratitude for the treatment which had been provided. Mindful of this, we endeavoured to maintain a clear distinction between those who were providing the dental care and those who were involved with the research. Another important methodological criticism is that there was no comparison group which did not get the intervention. Obtaining ethical approval to conduct a randomized control trial (RCT) of treatment under GA vs no treatment would not have been possible. Any comparison group obtained through any approach other than randomized allocation would not have been directly comparable anyway and there would always be the suspicion that the two groups were not able to be compared. This is the nature of health services research; methodological compromises are usually necessary because such work takes place in the 'real world' of the health care system [13].

We found some differences in the underlying factor structure of the FIS to those reported originally by Locker et al. [12] in their study of a clinical convenience sample in Toronto. The current study's confirmatory factor analysis revealed some problems with the *parental emotions* sub-scale which perhaps need further scrutiny. It is worth noting that our sample was considerably younger than that used in the Canadian study and that 100% of the patients (but only one-quarter of the Canadian sample) were paedodontic patients. Thus, it may be that the item 'worried that your child may have fewer life opportunities' would not have the same salience that it would for parents of older children with malocclusions or orofacial clefts. Nevertheless, the *parental emotions* sub-scale performed well and showed an effect size which was of similar magnitude to that observed with the overall FIS and the *parental/family* sub-scale, so the clinical relevance of those problems is unclear.

In conclusion, the FIS appears to be a promising measure for use in dental health services research. Severe dental caries is not merely a restorative and preventive challenge for those who treat children; it has far-reaching effects on those who share the household and care for the affected child. Treating young children with severe dental caries under general anaesthesia is associated with marked improvements for the family and not just for the child.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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