CROSS CULTURAL ADAPTATION AND VALIDATION OF THE EARLY CHILDHOOD HEALTH IMPACT SCALE (ECOHIS) IN PERUVIAN PRESCHOOLERS

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ABSTRACT

The aim of the present work was to perform semantic adjustment and evaluation of the psychometric properties of the Early Childhood Health Impact Scale (ECOHIS) in Spanish on a sample of the Peruvian population.

The study was conducted on a sample of 128 children aged 3-5 years, who attended a public school (Hualmay District, Huaura Province, Lima, Peru) in 2011. The ECOHIS questionnaire, developed to measure the impact of oral conditions and/or experiences of dental treatment on oral health-related quality of life in children under 5 years old and their parents or other family members was adapted cross-culturally and subjected to psychometric tests: validity (in terms of construct and discriminant) and reliability (in terms of internal consistency and stability).

The cultural adaptation addressed ECOHIS semantic equivalence (Bordoni et al., 2012) and showed that 80-100% of respondents understood the questions. Construct validity was r = .557 (p <.05) between the scores of the Spanish version of ECOHIS and dental caries experience (dmft). Statistically significant differences (p <.001) were found for ECOHIS values between groups with and without tooth decay. Internal consistency was assessed by Cronbach's alpha (.948) and stability by intra-class correlation (.992).

The Peruvian version of ECOHIS demonstrated acceptable validity and reliability, enabling assessment of the impact of oral health problems in children under 5 years old.

Key words: *Quality of life, dental care for children, oral health.*

VALIDACIÓN Y ADAPTACIÓN CULTURAL DE LA ESCALA DE IMPACTO DE LA SALUD BUCAL EN LA NIÑEZ TEMPRANA

RESUMEN

El objetivo de este trabajo fue realizar el ajuste semántico y la evaluación de las propiedades psicométricas del Early Childhood Oral Health Impact Scale (ECOHIS), en la versión en español, sobre una muestra de la población peruana.

El estudio se realizó en una muestra de 128 niños de 3 a 5 años de edad, asistentes a un centro educativo público (Distrito Hualmay, Provincia de Huaura, Lima; Perú) durante el año 2011. El cuestionario ECOHIS, desarrollado para medir el impacto de las condiciones bucales y/o experiencias de tratamientos odontológicos sobre la calidad de vida relacionada a la salud bucal de niños menores de 5 años y de sus padres u otros miembros de la familia fue adaptado transculturalmente y sometido a pruebas psicométricas: validez (en términos de constructo y discriminante); y confiabilidad (en términos de consistencia interna y estabilidad)

La adaptación transcultural abordó la equivalencia semántica del ECOHIS (Bordoni et al., 2012) y demostró que el 80–100% de los encuestados comprendían las preguntas. La validez de constructo alcanzó un valor de r=.557 (p<.05) entre las puntuaciones de la versión en español del ECOHIS y la experiencia de caries dental (ceod). Los valores del ECOHIS entre los grupos con caries y sin caries se hallaron diferencias estadísticamente significativos (p<.001). La consistencia interna fue evaluada a través del Alpha de Cronbach (.948) y la estabilidad a través de la correlación intraclase (.992). Puede concluirse que la versión en español del ECOHIS demostró aceptables validez y confiabilidad permitiendo evaluar el impacto de los problemas bucales en niños menores de 5 años.

Palabras clave: *Calidad de vida, cuidados dentales en niños, salud bucal.*

INTRODUCTION

The World Health Organization (1997) defines health in terms of physical, psychological and social wellbeing. The concept of oral health calls for the inclusion of previously unconsidered factors such as oral symptoms, functional limitations, emotional and social wellbeing and reflection on its impact on quality of life.[1] In general, individual and collective oral health status is still predominantly evaluated by means of clinical indicators which only determine presence or absence of disease and its severity. For dental

caries, there are various indices including, among others, indices for the history of the disease (DMFT or its derivatives), development process (ICDAS, Nyval et al.), risk factors involved (Cariogram) and the need for treatment (N, and its consequences (PUFA). However, since the mid-20th century, there has been concern to identify the impact of different diseases and/or treatments on the patient's quality of life. In this line, indicators have been developed to measure oral health-related quality of life (OHRQoL) applied to different age groups[2]. For children under 5 years of age, instruments such as the following have been developed: Michigan COHRQoL Scale[3], Early Childhood Oral Health Impact Scale (ECOHIS)[4] and Scale of Oral Health Outcomes for 5-year-old children (SOHO-5)[5], whose validity and reliability have been confirmed.

The ECOHIS measures the impact of oral problems and/or experience of dental treatment on the quality of life in children under 5 years old and their parents or other family members. It has 13 questions divided into two domains: one related to impact on the child (9 questions), and another to impact on the family (4 questions), measured using the Likert scale[4,6-16]. It was recently validated on a sample of Venezuelan and Argentine children from different socioeconomic groups[11].

In Peru, caries prevalence in early childhood has been recorded as 11% to 96% in different populations[17], but there is no study yet regarding its impact on quality of life. Recognizing its impact may contribute to prioritising the problem individually and collectively.

The aim of this study was to perform semantic equivalence and validation of the ECOHIS in a sample of Peruvian families.

MATERIALS AND METHODS

This study was conducted on a sample of 128 children aged 3 - 5 years at a preschool in Hualmay District (Huaura Province, Lima Department, Peru) in 2011. Hualmay District is located 150 Km. away from Lima at 32 meters above sea level. According to the 2007 11th National Population Census (conducted by the Peruvian National Institute of Statistics and Informatics, INEI) nominal population is 26,808[18]. Study design was approved by the Institutional Ethics Committee of Cayetano Heredia Peruvian University, Lima, Peru and authorized by the director of the preschool. Parents or guardians provided informed consent for the children to participate in the study.

For the validation phase, inclusion criteria were children of both sexes with apparent good general health status and informed consent from parents or guardians.

Preliminary phase: semantic equivalence

The preliminary phase was a pilot test on a selected convenience sample of 25 caregivers of children who attended a preschool in Huaura Province. It was based on the ECOHIS translation and semantic and psychometric validation by Bordoni et al. (2012)[11]. Semantic equivalence was used to measure respondent understanding of the questions[2].

Validation phase

The semantically adjusted questionnaire was administered to the 128 caregivers who did not participate in the preliminary phase.

The clinical study included the participation of authorized children who showed an attitude of willingness to cooperate. Clinical diagnosis was done by applying the WHO[25] criteria, by a researcher who was calibrated by a reference examiner.[1] Kappa values were 0.97 between examiners and 0.969 within examiners. The same researcher applied the questionnaires according to the criteria recommended by Bordoni et al.[11]

Statistical processing: *Validity and reliability of the ECOHIS instrument*

Reliability was analyzed in terms of internal consistency and stability. Validity was analyzed in terms of construct and discriminant[4,7-16].

Internal consistency was measured by Cronbach's alpha coefficient[4,7-16].

Questionnaire **stability** was determined during the preliminary phase by having the same subjects answer ECOHIS a second time after a 1-week interval, in order to correlate their answers and determine whether there were any differences (test-retest). It was determined by Spearman's correlation [4,7-16].

Construct validity was assessed by applying Spearman's correlation coefficient to determine how the overall score and the scores for each ECOHIS domain correlated to the dmft index and its

components[9,14-16]. The correlation coefficients were interpreted as follows: $r \leq 0.49$, weak correlation; $0.50 \leq r \leq 0.74$, moderate correlation, and $r \geq 0.75$, strong correlation[26].

Discriminant value was determined by comparing the overall score as well as the scores for each ECOHIS domain to absence and presence of caries in early childhood. Mann-Whitney's U test was applied using the following hypotheses:

- High ECOHIS scores correspond to children with caries in early childhood.
- Effect size (size of the difference between groups) should be statistically moderate or high[8,15].

The effect size (ES) was calculated using the formula $ES = x_1 - x_2 / r$, where x_1 is the mean value for the group without caries, x_2 is the mean value for the group with caries and r is the grouped standard deviation for the two groups[8,27].

For statistical analysis, data were stored in a database and processed using version 20.0 SPSS statistical software.

RESULTS

Demographics (Table 1):

1. Children:
   a. most frequent age was 5 years (42.2%) and
   b. predominating sex was female (52.3%).
2. Caregivers:
   a. most frequent sex was female (96.1%),
   b. most frequent age group was 15 to 30 years (55.5%),
   c. the majority had secondary school education (75.8%) and
   d. the most frequent respondent relationship to the child was mother (89.1%).

The **semantic equivalence** of the Spanish version of the questionnaire applied to the sample of a Peruvian population showed the following results:

1. Caregiver understanding of the questions was 80% to 100% (Table 2)
2. Some expressions were adapted by making changes such as:
   - *has expressed irritation* **to** *has been irritated*,
   - *has avoided smiles* **to** *avoided smiling*,

Table 1: Demographics at a preschool in Hualmay District, Huaura Province, Lima Department, 2011 (n=128).

Demographics of children and their caretakers	n	%
Child's age		
3 years	39	30.50
4 years	35	27.30
5 yers	54	42.20
Child's sex		
Male	61	47.70
Female	67	52.30
Caretaker's sex		
Male	5	3.90
Female	123	96.10
Caretaker's age		
15 - 30 years	71	55.50
31 - 46 years	48	37.50
47 - 62 years	9	7.00
Caretaker's level of education		
Primary	7	5.50
Secondary	97	75.80
Technical	8	6.20
University	16	12.50
Caretaker's relationship to child		
Mother	114	89.10
Father	3	2.30
Other	11	8.60

Table 2: SEMANTIC EQUIVALENCE. Distribution of comprehension of questions in the ECOHIS questionnaire among 25 caretakers.

	Question												
Comprehension	**1 %**	**2 %**	**3 %**	**4 %**	**5 %**	**6 %**	**7 %**	**8 %**	**9 %**	**10 %**	**11 %**	**12 %**	**13 %**
Yes	10	10	10	10	10	10	92	92	10	84	10	92	80
	0	0	0	0	0	0	8	8	0	16	0	8	20
	0	0	0	0	0	0			0		0		
No	10	10	10	10	10	10	10	10	10	10	10	10	10
	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

- *has been upset* **to** *has been upset or worried*,
- *spend time* **to** *has spent time, and*
- *have had an economic impact on your family* **to** *have affected the economy of your family or home*

3. The questionnaire stability test showed that the intra-class correlation coefficient (ICC) was 0.992 for overall ECOHIS score, 0.993 for the domain Impact on Child and 0.961 for the domain Impact on Family.

The Spanish version of the ECOHIS for the Peruvian population was validated on a total 153 preschoolers and their caregivers. Answers were grouped as: "never, hardly ever" and "occasionally, often, very often". It was found that:

a. The questions about *pain* (62.5%), *difficulty eating* (54.7%), *irritation or frustration* (55.5%) and *difficulty drinking hot or cold beverages* (47.6%) had the most answers in the domain Impact on Child (Table 3).
b. The questions with greatest impact in the Family domain were about *"have you or a family member been upset"* (53.1%), *"felt guilty"* (42.9%) and *"affected the economic situation of your home"* (44.5%) (Table 3).
c. In the domain of Impact on Child, functional limitation had the highest average answers (5.22) (Table 4).
d. The correlation between overall ECOHIS score and dmft was r= 0.557 (p<.001). For the

Table 3: Caretaker's perception of children's oral health-related quality of life at a preschool in Hualmay District, Huaura Province, Lima Department, 2011 (n=153).

Early childhood oral health impact scale – ECOHIS	Never/ Hardly ever n (%)	Occasionally/ Often/ Very often n (%)	Don't know n (%)
Impact on the child			
1. Pain in the teeth, mouth or jaws	47 (36.7)	80 (62.5)	1 (0.8)
2. Difficulty drinking hot or cold beverages	66 (51.6)	61 (47.6)	1 (0.8)
3. Difficulty eating some foods	58 (45.3)	70 (54.7)	0 (0.0)
4. Difficulty pronouncing any words	85 (66.4)	41 (32.1)	2 (1.6)
5. Missed preschool, day-care or school	89 (69.5)	39 (30.5)	0 (0.0)
6. Had trouble sleeping	77 (60.1)	51 (39.9)	0 (0.0)
7. Been irritable or frustrated	57 (44.5)	71 (55.5)	0 (0.0)
8. Avoided smiling	96 (75.0)	31 (24.3)	1 (0.7)
9. Avoided talking	98 (76.5)	30 (23.5)	0 (0.0)
Impact on family			
10. You or another family member felt worried	60 (46.9)	68 (53.1)	0 (0.0)
11. You or another family member felt guilty	73 (57.1)	55 (42.9)	0 (0.0)
12 You or another family member spent time	75 (58.6)	53 (41.4)	0 (0.0)
13. Have affected the economy of your family or home	71 (55.5)	57 (44.5)	0 (0.0)

Table 4: Overall score and score for each domain in the ECOHIS.

Oral health-related Quality of life ecohis	Mean	Standard deviation	Overall ECOHIS score	
			Minimum	Maximum
Impact on child				
Oral symptoms (1)	1.67	1.02	0	4
Functional limitations (4)	5.22	3.42	0	13
Psychological aspects (2)	2.59	1.78	0	7
Self image/social interaction (2)	1.90	1.66	0	7
Impact on family				
Parental worry (2)	2.95	1.91	0	8
Family function (2)	2.69	1.76	0	8
Overall ECOHIS score	17.02	10.16	0	46

( ) Number of questions

domain Impact on Child, r= 0.540, (p<.001) and for Impact on family, r= 0.560 (p<.001). The correlation with the component "decayed" was r=0.559, (p<.001) (Table 5).

e. Mean ECOHIS scores and scores in each domain differed significantly between children with and without caries in early childhood (p<.001). The Effect Size (ES) for overall ECOHIS score between groups with and without caries was 0.527; while for each section it was 0.460 and 0.531 respectively (Table 6).

f. For **internal consistency**, Cronbach's alpha test values were 0.925 for the domain Impact on Child, 0.882 for the domain Impact on Family, and 0.948 for overall ECOHIS score (Table 7).

DISCUSSION

This study validated the ECOHIS on a sample of 128 children and their caregivers.

Semantic equivalence was done with a convenience sample of participants (25 caregivers) and led to the modification of a few terms. Tesch et al. and other authors conducted a similar procedure[6-9,11,14].

The ECOHIS questions most frequently answered by the caregivers for the section on Impact on Child were about pain, difficulties eating and drinking, and irritation or frustration, while for the section Impact on Family, they were about feeling guilty or worried. Similar results were found by other authors[4,8,9,12-16]. This might suggest that oral health often has a negative impact on quality of life. Other studies – on populations which either were a stratified sample according to living conditions, received

Table 5: CONSTRUCT VALIDITY: Correlation between the Early Childhood Oral Health Impact Scale (ECOHIS) and dmft.

Early childhood caries	Oral health-related quality of life ECOHIS		Overall ECOHIS score
	Section Impact on Child	Section Impact on Family	
dmft	0.540*	0.560*	0.557*
Decayed	0.543*	0.557*	0.559*
Missing	0.167	0.183*	0.176*
Filled	-0.110	-0.005	-0.084

Spearman's correlation coefficient
* Statistical significance p<0.05

Table 6: DISCRIMINANT VALIDITY: Mean overall ECOHIS scores and scores per section compared to early childhood caries status.

ECOHIS	Early childhood caries		Effect size (ES)	p value
	With caries	Without caries		
Section Impact on Child	12.55 (6.82)	6.00 (5.75)	0.46	p<.001
Section Impact on Family	6.28 (3.29)	2.74 (2.26)	0.52	p<.001
Overall ECOHIS score	18.83 (9.74)	8.74 (7.75)	0.53	p<.001

Mann Whitney's test
Mean (S.D.)

Table 7: RELIABILITY ANALYSIS: Internal Consistency and Test-Retest.

ECOHIS (Number of questions)	Internal consistency (Cronbach's alpha)	Test– Retest ICC
Section Impact on Child (9)	0.925	0.993
Section Impact on Family (4)	0.882	0.961
Overall score (13)	0.948	0.992

care at a university hospital,[9] were participants in oral health promotion programs[15] or received care at different health institutions[4,12,16] – found differences in the perception of impact.

Other studies report that children with untreated caries may have difficulty chewing, sleeping and socializing and that caries may affect self-confidence, growth and weight increase, thus producing a negative effect on quality of life.[16] Lack of prevention policies and early care is a variable influencing these results.

The frequency of the answer "don't know" to the questions was low. Lee et al.[8] report that parents rarely answered "don't know". This may suggest that these OHRQoL questionnaires could be used at clinics for to orient diagnoses for preschoolers. The answer *"*don't know*"* was treated as in previous studies,[4,7-16] i.e. the number and distribution of "don't know" answers were taken into account in the statistical analysis, because they are important, particularly to the processes of instrument validation and use, providing insight into the relevance and understanding of the questions.[14] "Don't know" is an essential option in studies where participants report their perceptions of someone else's health or quality of life, because it reflects a particular characteristic of the phenomenon under evaluation.[15] Moreover, parents' awareness of oral-health related quality of life could be explored by examining the frequency and distribution of "don't know" answers.[28]

Construct validity showed that there was moderate correlation between overall ECOHIS scores and caries experience (dmft). These results proved the validity of the measurement. There were similar findings for the versions used in China[8], Turkey[14] and Uganda[16]. However, Martins et al.[15] report that ECOHIS was significantly but weakly correlated to caries experience. Levine et al. report that untreated decayed primary teeth may remain asymptomatic until exfoliation, which is why parents might not notice them.[29]

However, our study and studies by Pahel et al.[4], Lee et al.[8], Scarpelli et al.[12] and Peker et al.[14] determined construct validity by means of the correlation between ECOHIS scores and dmft and dmfs, finding moderate correlations. Similarly, Peker et al. report that ECOHIS construct validity could be proved by using other indicators such as gingival index, since according to McGrath et al.[30] and Carvahlo et al.[31], gingivitis is an inflammatory process which begins at about 5 years of age. It might be an oral condition that could compromise the child's oral health-related quality of life.

Discriminant validity was proved because significant differences were found between mean values for overall ECOHIS scores for groups of children with and without caries. These findings are similar to those of other ECOHIS validation studies[4,9,14-16], where children with dental caries had the highest scores. These results prove that the Spanish version of the ECOHIS is able to discriminate between these two groups of children. One important finding is that the analysis of Effect Size showed moderate clinical significance of the difference between groups with and without caries. Martins et al. found similar results, and report that studies in the field of psychology increasingly measure Effect Size, which is essential to good research.[15] Nevertheless, the socio-cultural homogeneity of the families in this study should be considered, as Bordoni et al. found differences in the ECOHIS score for answers from groups of parents from families with different socioeconomic levels.[11]

Our study found Cronbach's alpha coefficients of 0.935 for the domain Impact on Children, 0.882 for Impact on Family and 0.948 for the overall ECOHIS, which proves good internal consistency of the Spanish version of the ECOHIS. Cronbach's alpha values were close to the ones for ECOHIS versions for Latin America[11], Iran[9] and Turkey[14] and higher than the ones for versions for France[7], China[8], Brazil[15], Uganda and Tanzania[16].

The intra-class correlation for the overall score showed an excellent level of agreement between the test-retest results, similar to the value reported for Turkey[14] (0.95) and higher than the values reported for the versions for North America[4], China[8], Persia[9], Uganda[16] (0.84, 0.64, 0.82 and 0.84 respectively). Other validation studies, such as the version in Portuguese,[12] do not report an ICC value for overall score, but the values for the sections Impact on Child and Impact on Family are similar to ours. Martins et al. report that the result for reliability of internal consistency of the domain Impact on Family was marginal, as found in the preliminary study of the Portuguese version of the ECOHIS by Scarpelli et al.[12] This may be due to the fact that this domain includes only four questions, whereas the section Impact on Child includes nine.

It has been shown that the value of alpha tends to be higher for measurements that include a larger number of items.[15]

Psychometric tests of the scale showed optimum construct and discriminant validity, and reliability in terms of internal consistency and test-retest. Peker et al. suggest that ECOHIS sensitivity should also be determined because there are few studies in this regard (Li et al.)[32]. Sensitivity assesses the effect of dental diseases and their treatment on quality of life.[33]

Using the ECOHIS may help healthcare professionals, researchers and public and private agencies to describe the effects of dental diseases and experience of treatment on the quality of life of young children and their families, to plan oral interventions, to promote oral health and to improve and implement oral healthcare services for the Peruvian population, where children under 5 years of age represent one of the highest risk groups for oral health.

CONCLUSIONS

1. The Spanish version of the ECOHIS was cross-culturally adapted to the Peruvian population by means of small changes to some of the questions.
2. Psychometric tests demonstrated construct validity, discriminant validity, internal consistency and reliability in the application of test-retest.
3. This study therefore provides initial evidence that the ECOHIS could be a useful tool for assessing oral health-related quality of life in preschoolers in the Peruvian population.

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