

Cross-cultural Adaptation and Psychometric Properties of the Mexican Version of the Early Childhood Oral Health Impact Scale (ECOHIS).

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Research

Keywords: Child, oral health, psychometrics, quality of life, questionnaires

Posted Date: September 17th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-77035/v1>

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Version of Record: A version of this preprint was published on March 21st, 2021. See the published version at <https://doi.org/10.1186/s12955-021-01747-3>.

Abstract

Background: Mexican population still a lack of instruments to assess OHRQoL in preschoolers. To perform the cross-cultural adaptation and evaluate the psychometric properties of the Mexican version of the ECOHIS.

Methods: This cross-sectional study was conducted with preschool children from southern Mexico. The investigation was divided into a transcultural adaptation phase and the validation phase. The M-ECOHIS questionnaire was answered by guardians and clinical data were also evaluated. Reliability was evaluated through tests of internal consistency and stability. Convergent and construct validity were also evaluated. The discriminant validity of the M-ECOHIS was determined according to questionnaire scores with oral health measures.

Results: A total of 303 preschool children participated in this study. Regarding internal consistency, Cronbach's alpha was higher 0.78 for the child section, family section, and general M-ECOHIS. The general ICC for the test-retest reliability was 0.95. The correlation between the scores obtained on the child and family impact sections was significant and all items of the M-ECOHIS confirmed the latent variables. M-ECOHIS scores were associated with the presence of untreated dental caries.

Conclusion: Our findings suggest that M-ECOHIS is a valid and reliable instrument to assess the impact of oral health on OHRQoL in Mexican preschool children.

Background

Currently, oral health is defined and in terms of physical, psychological, and social well-being [1]. However, despite efforts to optimize health levels, different oral health problems continue to be one of the most common problems in the world [2], especially dental caries, which despite its decrease is still highly prevalent worldwide [3]. Specifically in Mexico, in children aged 2 to 10 years, the mean of decayed, missing and filling teeth (DMFT) index was 3.8 [4]. Thus, oral health problems continue to be a public health challenge in the country.

In this context, the different clinical outcomes are strong predictors of the prevalence of negative impacts on OHRQoL in the affected individuals [5–7]. OHRQoL has been defined as a multidimensional construct that reflects the extent of the impact that health or oral disease has on the daily life and well-being of individuals [8, 9]. Thus, OHRQoL is considered an essential parameter in the evaluation of the patient, since oral health and its multiple dimensions have been increasingly pointed out as an integral and fundamental part of oral health [1, 9].

Several instruments have been developed to measure OHRQoL, most of them self-administered questionnaires, also called dental partner or dental indicators [10]. However, most questionnaires to measure OHRQoL are aimed at the adult population. Notwithstanding, after a few years, there was an interest in the impact of oral diseases on children's quality of life, since that this age group needs an

assessment different from that measured in adults [11]. Thus, different instruments were developed and validated for children, including those under 5 years old [12].

In relation to preschool children, Pahel et al. developed and validated in the United States of America the Early Childhood Oral Health Impact Scale (ECOHIS), which assesses the impact of oral health conditions and experiences with dental treatments on the quality of life of children of preschool age and their parents or other family members, for use in epidemiological studies [13]. The questionnaire consists of 13 questions divided into two sections: the impact of oral health on the child - CIS (9 questions) and the impact on the family - FIS (4 questions). The scale has five rating response options to record how often an event has occurred in the life of the child: 0 = never; 1 = hardly ever; 2 = occasionally; 3 = often; 4 = very often; 5 = don't know. CIS and FIS ECOHIS scores range from 0 to 36 and 0 to 16, respectively, for which higher scores indicate a poorer OHRQoL.

In recent years, different versions of ECOHIS have been translated, adapted, and validated for different languages [14, 15]. Among them, a version was adapted for Spanish for administration in Latin America, resulting in a reliable and valid application¹⁶. However, to our knowledge, there is still no version adapted and validated specifically for the Mexican population. Thus, the present study aimed to perform the cross-cultural adaptation and evaluate the psychometric properties of the ECOHIS for applicability in the Mexican preschool children. We hypothesized that the Mexican version of ECOHIS had good psychometric properties.

Methods

Ethical Issues

This research is in accordance with the Declaration of Helsinki and in accordance with NOM-012-SSA3-2012, which establishes the criteria for the execution of health research projects in humans. This project was also presented to the ethics committee of the Centro Universitario de Los Altos. All parents or guardians signed an informed consent form.

Study design and sample

This cross-sectional study was conducted on a sample of 303 preschool children aged 3–5 years old in the city of Tepatitlán de Morelos, located in the southern high region of Jalisco in Mexico in 2017. According to the 2015 National Population Census) conducted by the Institute of Statistical and Geographic Information of Jalisco, IIEG) the population is 141,322. Considered all public and private preschools of Tepatitlán de Morelos, 10 (6 publics and 4 private) of 55 preschools were randomly selected. Parents or guardians provided informed consent for the children to participate in the study.

The sample size requirements were evaluated according to the power calculation for this study's sample. The power calculation accounted for an alpha error probability of 0.05, overall ECOHIS scores of 1.8 (standard deviation [SD] 3.7) in non-exposed group (without untreated dental caries) and 4.7 (SD 5.5) in

the exposed group (with untreated dental caries), resulting in a sample power of 99.9%. For the validation phase, inclusion criteria were preschool children of both sexes with good general health status and complete temporary dentition, informed consent from parents or guardians and socioeconomic questionnaire answered by the parents or guardians.

Preliminary phase: Transcultural adaptation of ECOHIS

The ECOHIS was originally developed in English and validated in North Carolina [13] and evaluates the impact of oral health conditions and experiences with dental treatments on the quality of life of preschool children (3 to 5 years old) and their parents or other family members, to be used in epidemiological studies. The translation of ECOHIS into Spanish was made for its administration in Latin America, resulting reliable and valid for its application [16].

A committee consisting of four pediatric dentists was convened to discuss the semantics of the translated version of ECOHIS in the Spanish language, and some changes were made to achieve a better understanding of the questions; obtaining a version that was used to apply the pilot test to a convenience sample of 30 parents of child patients who attended the clinic of the specialty in Pediatric Dentistry of the Centro de Atención Médica Integral de Centro Universitario de los Altos de la Universidad de Guadalajara. The retest was applied to the same participants one week after the first test in order to correlate their answers and determine whether there were any differences. The responses given by the participants were evaluated and no modification was necessary.

M-ECOHIS and socioeconomic questionnaire application

The semantically adjusted questionnaire and socioeconomic questionnaire were administered to the 303 parents or guardians who did not participate in the preliminary phase. The M-ECOHIS and the socioeconomic questionnaire was answered by one of the parents or guardians of the child and were applied through face-to-face or telephone interviews, conducted by trained interviewers. A previous study showed that the ECOHIS questionnaire was valid by telephone, with no differences in the face-to-face application method [17]. The questionnaires were applied before carrying out the child's oral clinical examination.

Demographic and socioeconomic variables included sex (boys and girls), age (in years), type of school (public or private), maternal education, and family income. Maternal education was collected in years and categorized into < 8 years of formal education or \geq 8 years of formal education. Household income was evaluated in Mexican peso (Mex\$ 26.60 it was equivalent to US\$1.00 approximately) and dichotomized by the median for the analysis.

Oral clinical examination

Clinical data were collected from dental examination records by four researchers who were previously calibrated for the assessment of dental caries according to the World Health Organization (WHO) criteria [18], by theoretical class, in-vitro practice with natural teeth and clinical examinations on 5 children who received attention in the pediatric dentistry clinic. Clinical examinations were performed in preschool, in

normal chairs with the help of light, tongue depressor, gauze and periodontal probes (“ball point”). Inter- and intra-examiner reproducibility for clinical variables was considered good (Kappa value > 0.7).

The presence of dental caries was evaluated according to the number of decayed, missing, and filled teeth (dmft index). For the analysis, the $dmft \geq 1$ and also the presence of untreated dental caries (recorded as a non-zero d component in the dmft index) were considered. Were also assessed the presence of dental trauma in upper incisor teeth (absence or presence), and occlusal disorders (lip coverage and anterior open bite), recorded as absence or presence [18].

Statistical analysis

Data analysis was performed using STATA 14 (StataCorp. 2014. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP). Demographic, socioeconomic and clinical oral health characteristics were described using Stata’s “svy” command for complex data samples.

Reliability was evaluated through tests of internal consistency and stability. The internal consistency of the child and family sections and overall was assessed using the Cronbach's Alpha Coefficient. Values ≥ 0.70 were considered acceptable for comparisons between groups [19]. Test-retest reliability was determined through the calculation of the Intraclass Correlation Coefficient (ICC) for the scores on child and family sections, as well overall. ICC values ≥ 0.60 are considered good and ≥ 0.80 excellent [20]. For this approach, the M-ECOHIS was responded twice by 30 caregivers, with a seven-day interval between applications.

The convergent validity of M-ECOHIS was assessed through Spearman's Correlation Coefficient between child and family M-ECOHIS scores and self-reported oral health. The correlation with the overall M-ECOHIS scores was also assessed. In addition, Confirmatory Factor Analyses (CFA) were performed to evaluate the measurement model and the relationships among 13 items of the scale and the latent variables for the child and family section. For this approach, was used the estimator Maximum Likelihood (ML). Modification indices (MI) were used for statistical fit, as well as to evaluate the correlations between items. Standardized coefficient (SC) is represented by beta weights, indicating 0.10 value as small, 0.30 value as a medium, and > 0.50 values as a high factorial load [21]. The goodness-of-fit was measured using A Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). The RMSEA value < 0.05 and CFI and TLI < 0.90 denotes an adequate fit, respectively. The Standardized Root Mean Square Residual (SRMR) indicates an adequate fit when a value lower than 1.0 [21].

The discriminant validity of the M-ECOHIS was determined according to questionnaire scores with oral health measures (dental caries, dental trauma, lip coverage and anterior open bite). We hypothesized that children with higher levels of the oral disease were more likely to have higher scores in the child session, family session, as well as in the general M-ECOHIS scores. Unadjusted Poisson regression models were used for test these hypotheses. The results are as a rate ratio (RR) and its respective 95% confidence interval (95% CI). Variables with P value < 0.05 were considered significant.

Results

A total of 303 preschool children participated in this study. Table 1 shows characteristics of the sample according to demographic, socioeconomic and clinical variables. The sample consisted of a similar proportion between girls and boys, and the majority of the children had 5 years of age (53%) and studied in public schools (56.4%). Regarding maternal education, most mothers had more than 8 years of schooling. Approximately 55% of the children had untreated dental caries and 11.3% had an open anterior bite.

Table 1
 Characteristics of the sample according to demographic, socioeconomic and oral health variables (n = 303)

Variables	n	(%)*
<i>Demographic and socioeconomic variables</i>		
Sex	155	(51.0)
Boys	148	(49.0)
Girls		
Age	22	(8.7)
3	118	(38.3)
4	163	(53.0)
5		
Type of school	179	(56.4)
Public	124	(43.6)
Private		
Maternal education	43	(14.2)
< 8 years of formal education	260	(85.8)
≥ 8 years of formal education		
Household income in Mex\$ ^a	119	(50.1)
< 7,000	111	(49.9)
≥ 7,000		
<i>Clinical variables</i>		
Dental caries experience	166	(55.0)
Dmft = 0	137	(45.0)
Dmft ≥ 1		
Untreated dental caries	159	(52.1)
Absence	144	(47.9)
Presence		

*Taking into account the sample weight; Values lower than 303 due to missing data.

^aMex\$, Mexican peso (Mex\$ 26.60 it was equivalent to US\$1.00 approximately).

Variables	n	(%)*
Traumatic dental injury	295	(97.5)
Absence	8	(2.5)
Presence		
Lip coverage	275	(90.8)
Adequate	28	(9.2)
Inadequate		
Anterior open bite	270	(88.7)
Absence	33	(11.3)
Presence		
*Taking into account the sample weight; Values lower than 303 due to missing data.		
^a Mex\$, Mexican peso (Mex\$ 26.60 it was equivalent to US\$1.00 approximately).		

The descriptive distribution of responses to the M-ECOHIS is presented in Table 2. Regarding the child section, "pain in the teeth, mouth or jaws" (14.4%) was the most frequently reported impact (occasionally, often or very often) followed by "had difficulty pronouncing any" (7.9%). Regarding the family section, "a financial impact on your family" (12.6%) was the most frequently reported impact. The question that had the most responses "never" was that of "missed preschool, daycare or school" (94.1%), followed by "avoided talking" (91.3%). The overall mean of the M-ECOHIS scores was 3.2 [standard error (SE) 0.23]. In relation to sessions, the overall scores were 1.93 (SE 0.18) and 1.28 (SE 0.08) for the child and family session, respectively.

Table 2

Descriptive distribution of responses to the Mexican early childhood oral health impact scale (M-ECOHIS)
(n = 303)

Impact	Never	Hardly ever	Occasionally	Often	Very often	Mean (SE)
	N (%)	N (%)	N (%)	N (%)	N (%)	
Child session						
How often has your child had pain in the teeth, mouth or jaws?	197 (65.0)	62 (20.5)	37 (12.2)	6 (2.0)	1 (0.3)	0.52 (0.03)
<i>How often has your child [...] because of dental problems or dental treatments?</i>						
... had difficulty drinking hot or cold beverages	251 (82.8)	32 (10.5)	17 (5.6)	3 (1.0)	0 (0.0)	0.24 (0.04)
... had difficulty eating some foods	242 (79.9)	43 (14.2)	13 (4.3)	5 (1.7)	0 (0.0)	0.27 (0.04)
... had difficulty pronouncing any	255 (84.2)	24 (7.9)	18 (5.9)	3 (1.0)	3 (1.0)	0.25 (0.03)
... missed preschool, daycare or school	285 (94.1)	9 (3.0)	8 (2.6)	1 (0.3)	0 (0.0)	0.08 (0.01)
... had trouble sleeping	268 (88.5)	23 (7.5)	10 (3.3)	2 (0.7)	0 (0.0)	0.16 (0.01)
... been irritable or frustrated	269 (88.8)	19 (6.3)	12 (4.0)	2 (0.7)	1 (0.0)	0.18 (0.02)
... avoided smiling or laughing	276 (91.1)	16 (5.3)	9 (3.0)	2 (0.7)	0 (0.0)	0.12 (0.02)
... avoided talking	284 (93.7)	15 (5.0)	3 (1.0)	1 (0.3)	0 (0.0)	0.08 (0.2)
Family section						
<i>How often have you or another family member [...] because of your child's dental problems or treatments?</i>						
... been upset	251 (82.4)	29 (9.6)	19 (6.3)	3 (1.0)	1 (0.3)	0.26 (0.01)
... felt guilty	247 (81.5)	27 (8.9)	19 (6.3)	6 (1.2)	4 (1.3)	0.32 (0.04)

SE, standard error.

Impact	Never	Hardly ever	Occasionally	Often	Very often	Mean (SE)
	N (%)	N (%)	N (%)	N (%)	N (%)	
... taken time off from work	239 (78.8)	34 (11.2)	26 (8.6)	2 (0.7)	2 (0.7)	0.32 (0.04)
How often has your child had dental problems or dental treatments that had a financial impact on your family?	236 (77.8)	29 (9.6)	31 (10.2)	5 (1.7)	(0.7)	0.36 (0.02)
SE, standard error.						

Table 3 presents findings for internal consistency, reproducibility and convergent validity of the M-ECOHIS. Regarding internal consistency, Cronbach's alpha was 0.80 for the child section, 0.78 for the family section and 0.85 in general M-ECOHIS. The general ICC for the test-retest reliability (reproducibility) was 0.95. Regarding sections, the ICC was 0.60 and 0.90 for the child and family impact sections, respectively. Spearman's correlation among overall M-ECOHIS scores, the child and family section impact showed a significant convergent validity with the child's oral health status rating ($p < 0,05$). In relation to AFC (Fig. 1), all items of the M-ECOHIS confirmed the latent variables in the child and family section impact ($p < 0.01$). The most of SC presented high values (more than 0.5), confirming construct validity. The global adjustments of the parsimonious model were: SRMR = 0.05, CFI = 0.90, TLI = 0.87, RMSEA = 0.08 (0.07–0.09).

Table 3
Findings for internal consistency, reproducibility and convergent validity of the M-ECOHIS

Factors	Child section	Family Section	Overall
Cronbach's Alpha Coefficient	0.80	0.78	0.85
Intra-class Correlation Coefficient	0.60	0.90	0.95
Spearman's Correlation Coefficient ^a	0.42*	0.34*	0.43*
^a Convergent validity with oral health status rating; * $p < 0.05$.			

Findings for the discriminant validity of the M- ECOHIS are showed in Table 4. The results show that children with caries experience ($dmft \geq 1$) had higher overall scores on the M-ECOHIS (RR 3.40; 95%CI 2.08–5.54), as well as in the child's impact session (RR 3.44; 95%CI 2.25–5.24) and the family (RR 3.34; 95%CI 1.72–6.45). The same can be observed in relation to the presence of untreated dental caries. In addition, significant impacts were also observed in the child's session according to the presence of traumatic dental injuries. These results indicated a good discriminant validity of the M-ECOHIS.

Table 4
Findings for the discriminant validity of the M-ECOHIS (n = 303)

Variables	Child section		Family section		Overall	
	Mean (SE) ^a	RR ^b (95% CI) ^c	Mean (SE)	RR (95% CI)	Mean (SE)	RR (95% CI)
Dental caries experience	0.92 (0.11)	1.00	0.62 (0.08)	1.00	1.54 (0.18)	1.00
Dmft = 0	3.18 (0.22)	3.44 (2.25–5.24)*	2.08 (0.25)	3.34 (1.72–6.45)*	5.26 (0.39)	3.40 (2.08–5.54)*
Dmft ≥ 1						
Untreated dental caries	1.11 (0.09)	1.00	0.72 (0.06)	1.00	1.83 (0.13)	1.00
Absence	2.83 (0.25)	2.54 (1.77–3.64)*	1.89 (0.15)	2.61 (1.87–3.66)*	4.73 (0.30)	2.57 (1.91–3.47)*
Presence						
Traumatic dental injury	1.89 (0.18)	1.00	1.26 (0.08)	1.00	3.1 (0.24)	1.00
Absence	3.5 (0.96)	1.55 (1.03–2.20)*	1.90 (1.00)	1.49 (0.33–6.69)	5.4 (1.95)	1.70 (0.56–5.11)
Presence						
Lip coverage	1.85 (0.18)	1.00	1.28 (0.10)	1.00	3.1 (0.25)	1.00
Adequate	2.85 (0.25)	1.84 (0.75–4.52)	1.27 (0.16)	0.99 (0.55–1.77)	4.0 (0.23)	1.29 (0.93–1.80)
Inadequate						
Anterior open bite	1.8 (0.20)	1.00	1.30 (0.09)	1.00	3.1 (0.26)	1.00
Normal	2.3 (0.19)	1.23 (0.79–1.93)	1.22 (0.10)	0.92 (0.63–1.34)	3.5 (0.27)	1.23 (0.79–1.93)
Accentuated						

Taking into account the sample weight; ^aSE, standard error; *p < 0.05; ^bRR, rate ratio determined using unadjusted Poisson regression; ^cCI, confidence interval;

Discussion

This study aimed to validate a Mexican version of the ECOHIS questionnaire in a sample of Mexican children and their caregivers. As a main result, M-ECOHIS demonstrated validity in relation to consistency, reproducibility, convergent, and discriminant validity, in accordance with our hypothesis. Although ECOHIS has been validated in several countries, the Mexican population still needed validation of instruments to assess OHRQoL in preschoolers.

Approximately half of the children had untreated dental caries, which may influence that "pain in the teeth, mouth or jaw" was the impact most frequently reported in the child section. Previous studies indicate that children with untreated dental caries may have difficulty eating, sleeping and socializing, in addition to affecting your self-confidence, weight and growth, causing a negative impact on your quality of life [22–24]. Considering the family section, the item "they affected the economy in your family/home" was the most frequent impact reported, which could suggest that oral health often affects children's quality of life and their family's finances. These findings were according to previous studies [12, 15], which indicate that M-ECOHIS can be compared with other versions of ECOHIS performed in different countries and cultures.

Test-retest reliability (reproducibility) was adequate, with an ICC of 0.95, similar to the value reported in Peru [12], Brazil [25] and Turkey [26] and higher than the values reported in the United States of America [13] China [27] and Persia [22]. In this context, the Mexican version of ECOHIS showed excellent reproducibility, as it is capable of producing consistent results when administered at two different times to the same person [28]. Regarding internal consistency, Cronbach's alpha was 0.80 for the children's section, 0.78 for the family section, and 0.85 for the general M-ECOHIS, which indicates a good internal consistency that values 0.70²¹. Other ECOHIS validation studies have reported similar values [14,22,25,27]. In addition, all M-ECOHIS items confirm the latent variables in the impact of the child and family section, also confirming the construction validity, as recommended in the previous literature [21].

In addition, our findings demonstrated that children with caries experience and with untreated caries had significantly higher overall scores on the M-ECOHIS, demonstrating the questionnaire's discriminating ability. Similar results have been observed in other versions [12, 24, 26, 27]. As described, individuals with dental caries are more likely to have dental pain, difficulties sleeping and eating, which can directly impact a worse OHRQoL [29]. Notwithstanding, significant impacts were also observed in the child's section according to the presence of traumatic dental injuries, according to previous studies [30].

The present study was carried out in a sample of children from 3 to 5 years old, although this instrument has been developed and validated for use in children from 0 to 5 years old¹³, which can limit our findings. However, it is more difficult to obtain cooperation from children under 3 years of age, and only a minority in this age group attend nursery schools. In relation to the strengths, the application of this instrument in preschool children can make it possible to evaluate the effectiveness of oral health programs, in addition to prioritizing investments, evaluating treatment results, and comparing children's oral health throughout childhood [15]. Future studies are recommended, especially in Mexican populations, where instruments related to the quality of life have recently been validated.

Conclusion

The M-ECOHIS version was cross-culturally adapted from the version in Spanish, through changes in some questions and answers. Our findings suggest that M-ECOHIS is a valid and reliable instrument to assess the impact of oral health on OHRQoL in preschool children between 3 and 5 years of age.

Therefore, this study shows that M-ECOHIS can be a useful tool for future studies in the Mexican child population.

Abbreviations

ECOHIS

Early Childhood Oral Health Impact Scale; CFA:Confirmatory Factor Analysis; OHRQoL:Oral Health-related Quality of Life; WHO:World Health Organization; DMFT:decayed, missing and filling teeth; SD:standard deviation; SE:standard error; ICC:Intraclass Correlation Coefficient; ML Maximum Likelihood; MI:Modifications indices; SC:Standardized coefficient; RMSEA:Root Mean Square Error of Approximation; CFI:Comparative Fit Index; TLI:Tucker-Lewis Index; SRMR:Standardized Root Mean Square Residual; RR:Rate Ratio.

Declarations

Acknowledgements

The authors would like to thank all parents and children who participated in the study.

Authors' contributions

Ms Montoya conceptualized and designed the study, collected data, drafted the initial manuscript, and revised the manuscript. Ms Knorst performed the statistical analyzes and revised the manuscript. Ms Knorst designed the study, performed the statistical analyzes, drafted and revised the manuscript. Ms Uribe and Dr. González drafted and revised the manuscript. Dr. Ardenghi and Dr. Sánchez designed the study, coordinated and supervised the data collection and critically reviewed the manuscript. All authors have approved the final manuscript and agree to be accountable for all aspects of the paper.

Funding

The authors certify that have no affiliation with or financial involvement in any organization or entity with a direct financial or personal interest in the subject matter or materials discussed in this paper.

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki, and this research is in accordance with the NOM-012-SSA3-2012, which establishes the criteria for the execution of health research projects in humans. This project was also presented to the ethics committee of the Centro Universitario de Los Altos. Informed consent was obtained from all parents and children included in the study.

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest in relation to the products or methods mentioned herein.

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Figures

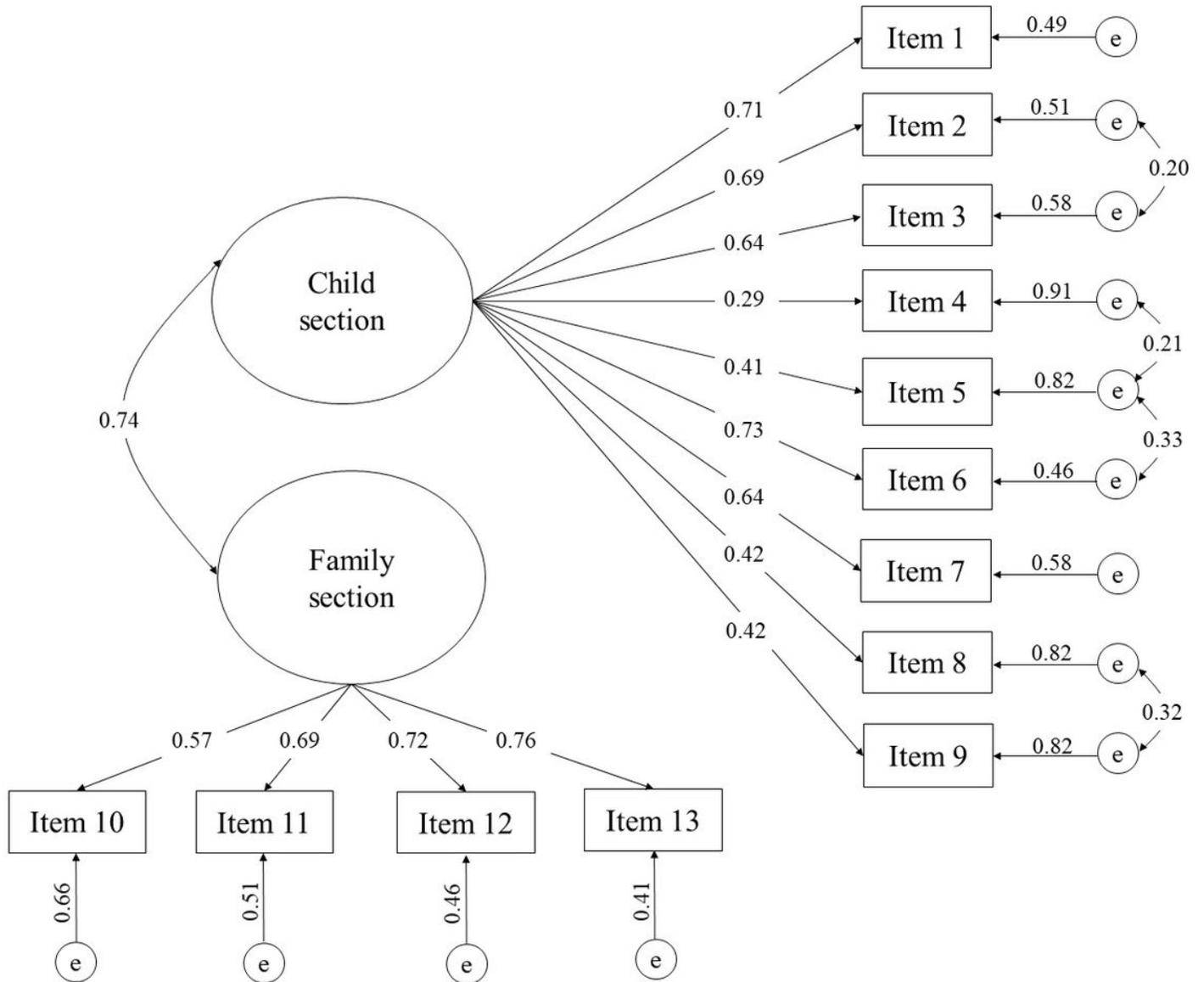


Figure 1

Confirmatory Factorial Analysis (CFA) of the M-ECOHIS questionnaire