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Transcultural adaptation of the WHO Oral Health Questionnaire and its validation in Chilean children.

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Abstract: Introduction: The last edition of the WHO "Oral Health Questionnaire for Children" was published in 2013. This is an only-English version, and as such it requires linguistic adaptation and validation to be applied in the Chilean population. Objectives: To translate and adapt the WHO Oral Health Questionnaire for Children to Spanish and validate it in a Chilean population. Methods: A translation and back translation of the original instrument from English to Spanish was carried out by four translators. The questionnaire was self-reported as a pilot test in ten individuals. A sample was subsequently selected for convenience taking into account the population distribution, resulting in a final sample of 103 individuals. The internal consistency was calculated with Cronbach's alpha, criterion validity with Pearson's correlation coefficient and construct validity with Exploratory Factor Analysis. Results: A conceptual and semantic equivalence of the instrument was obtained. Women and men accounted for 43.69% and 56.31% of the sample, respectively. Cronbach's alpha coefficient was 0.62, while criterion validity was slightly positive between the total dimensions and the DMFT ($r=0.13$, p -value= 0.20). The Exploratory Factor Analysis yielded a total of 11 factors that explain 70% of the variability in the data. Conclusions: The oral health questionnaire has been appropriately adapted to Spanish, having conceptual as well as semantic equivalence to the original version, being reliable and valid to be used in a population of 12-year-old Chilean children.

Keywords: validity; surveys and questionnaires; mass screening; oral health.

INTRODUCTION.

Epidemiological surveillance is central for the evaluation of health policies and programs regarding their implementation, follow-up and development, contributing to the improvement of the quality of life of different communities.¹⁻² Epidemiological surveillance in oral health has been based on the book Oral Health Surveys of the World Health Organization (WHO) since 1997, which is focused exclusively on clinical examination. In its 2013 version, in addition to clinical examination, the WHO included for the first time two questionnaires to be applied to children and adults through self-report or interview to evaluate risk factors in oral health. These instruments were published with the intention that different countries could take standardized measurements for public health surveillance, to assess risk factors and damage.³ After a literature search it was found that they had not yet been validated in Spanish.

As these questionnaires are only available in English, they need to be linguistically adapted and validated to be used in Latin America in order to determine the psychometric characteristics of the measurement instrument.

Consequently, it is imperative to have this adaptation and validation since it will provide researchers and health teams with a tool that will allow comparability between studies from different countries, languages or cultures.

The aim of this research is to translate and adapt the WHO Oral Health Questionnaire for Children to Spanish and validate it in the Chilean population.

MATERIALS AND METHODS.

A transversal design of adaptation and validation of the questionnaire, which was carried out in two phases: adaptation and validation.

Linguistic adaptation

Translation: In the linguistic adaptation stage, the translation and back translation technique from English (the original language of the questionnaire)³ into Spanish was used. The translation was carried out by two bilingual translators, native speakers of English, one a dentist and the other an English teacher, the latter from the Region of Valparaíso.

Back translation: Subsequently, the Spanish version was translated back into English by two individuals, native speakers of Spanish, who were not familiar with the original text and shared same characteristics of the English-to-Spanish translators.

Pilot test and research committee: The translated questionnaire was applied to a group of ten children as a pilot test, evaluating comprehension, language and writing skills. Response time was measured resulting in an average of 12-15 minutes per respondent. Adaptations were made between the group of researchers and the translators, resulting in the final translated version of the instrument in Spanish (Annex 1).

Validation

For criterion validity the DMFT index was used, requiring a single standardized observer according to the criteria recommended by WHO,³ and calibrated with a Lin coefficient of 0.96 (substantial level).⁴ A convenience sampling was carried out in 12-year-old

children, ensuring sample heterogeneity regarding sex, as reported by the National Statistics Institute of Chile.⁵ Data collection was carried out between April and June 2017 in four educational establishments of the city of Quillota, in the Region of Valparaíso. The questionnaire was completed and self-reported by 112 children, including each respective measurement of the DMFT index.

Of these, five children withdrew from the study while completing the questionnaire and another four while the clinical examination was performed. The final sample included 103 children. The study was approved by the Scientific Ethics Committee of Universidad Andres Bello, under resolution 005-05-2017.

Data analysis

STATA/SE 13 was used for data analysis. A descriptive analysis of the sample was made by sex and location. For the validity analysis, the following three dimensions were identified: "Oral Health" (items 3, 4, 5, 6, 7, 8, 9 and 10), "Habits" (items 11 and 12), "Education level of parents" (items 13 and 14). Of these, items 3, 8, 9, 10, 11 and 12 were subdivided according to the variables that made up each item, since these were nested questions. For internal consistency of item 8, the Cronbach's alpha and Kuder-Richardson coefficient 20 (KR-20) were calculated.

For construct validity, an exploratory factor analysis was performed by calculating the Kaiser-Meyer-Olkin index (KMO), and then an analysis of principal components with orthogonal varimax rotation was carried out. It should be noted that the factorial dimensions were not the same as the ones detailed in the previous paragraph, but they were new dimensions based on the correlation of variables of each item with each other.

For criterion validity, the items with increasing Likert-type variables, items 5, 7, 11a (only fresh fruit), 13 and 14 according to the cariogenic risk, kept their values; while variables of items 3, 4, 6, 9, 10, 11 and 12 presented an inverse sense, so they had to be recoded in terms of their direction in the sense of the aforementioned variables. The higher the cariogenic risk expressed, the higher the score obtained by each variable, which was then correlated with the DMFT of the individuals. Item number 8 was not used for this analysis as it included dichotomous variables.

Table 1. Changes in linguistic adaptation of the questionnaire.

Item	Change	Observation
No. 1	In identification of locality there are the options "urban", "peri-urban" and "rural". The "peri-urban" option is eliminated.	It is simpler for children to understand two options for identifying their living location
No. 8	Item refers to the use of hygiene instruments. One of the options is deleted, corresponding to the use or not of "chewstick / miswak".	This instrument of hygiene is not found in Chile or in Latin American culture
No. 13 and 14	The options are changed according to the Chilean educational system, leaving the following: 1. Does not have formal education 2. Incomplete basic education 3. Complete basic education 4. Full secondary education 5. Incomplete education 6. Full university 7. There is no male or female adult in the house 8. I do not know	Alternatives are adapted according to the Chilean education system.

Table 2. Analysis of factors (F) explained by each variable of the WHO oral health questionnaire.

Item / Variable	Factors or Dimensions of the construct										
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Item 3 Self-report on teeth state						0.89					
Item 3 Self-report on state of gums						0.68					
Item 4 Experience of pain or oral discomfort								0.58			
Item 5 Frequency of visits to the dentist									0.70		
Item 6 Reason for the last visit to the dentist											0.76
Item 8 Use of baking soda									0.68		
Item 8 Use of wooden toothpicks										0.83	
Item 8 Use of toothpaste										0.52	
Item 8 Use of toothbrush	0.90										
Item 8 Flossing	0.91										0.50
Item 10 Avoid smiling because of teeth				0.79							
Item 10 Missing classes at school				0.79							
Item 10 Feeding problems				0.53							
Item 10 Teasing by other children		0.64									
Item 11 CF of cookies, cake						0.78					
Item 11 CF of soft drinks								0.50	0.50		
Item 11 CF of tea with sugar								-0.51			
Item 11 CF of jam or honey					0.78						
Item 11 CF of fresh fruit					-0.71						
Item 11 CF of milk with sugar					0.62						
Item 11 CF of sugary chewing gum			0.57								
Item 11 CF of candy			0.61								
Item 11 CF of coffee sweetened with sugar			0.73								
Item 13 Educational level father/male legal guardian								0.86			
Item 14 Educational level mother/female legal guardian								0.83			

CF: Consumption frequency

Table 3. Changes in linguistic adaptation of the questionnaire.

Dimensions	Decayed		Filled		Missing		DMFT	
	r	p-value	r	p-value	r	p-value	r	p-value
Oral Health	0.07	0.38	-0,03	0.70	-0.15	0.14	0.001	0.99
Habits	-0.02	0.81	0.05	0.62	-0.07	0.47	0.17	0.09
Parent education	0.11	0.29	-0.005	0.96	-0.15	0.13	0.09	0.34
Total dimensions	0.06	0.57	0.0009	0.99	-0.18	0.07	0.13	0.20

RESULTS.

The translation and back-translation process resulted in a questionnaire adapted in terms of semantic, conceptual and content equivalence in most of the items, requiring minor modifications according to the Chilean sociocultural context (Table 1). Of a total of 103 individuals, 45 (43.69% [34.3-53.5]) were female and 58 (56.31% [46.5-65.7]) male. In terms of location, 87.25% [79.1-92.5] of the respondents lived in an urban location, while 12.75% [7.4-20.9] were from rural areas.

According to sex and DMFT, it was found that the mean value in males was 0.44; 95% CI [0.25-0.64], and 0.64; 95% CI [0.35-0.97] in females. At international level, the mean DMFT is 0.5; 95% CI [0.37- 0.71].

For the validation process, the internal consistency of the questionnaire evaluated with Cronbach's alpha yielded 0.57 for "Oral Health", 0.61 for "Habits," and 0.69 for "Educational level of parents", resulting in an overall value of 0.62. The Kuder-Richardson coefficient was 0.20 for item 8.

Regarding construct validity, the KMO index was calculated by factorial analysis, yielding a value of 0.62. The principal component analysis revealed a total of 11 factors or dimensions. These 11 dimensions explained 70% of the variability in the data. Each factor separately accounted for 5% to 6% of the variability. Variables "frequency of teeth cleaning", "use of plastic toothpicks", "fluoride content in toothpaste", "satisfaction with the appearance of the teeth", "frequency of smoking cigars or pipe" and "difficulty in chewing" were removed from the table because they did not have an absolute value greater than 0.5. Finally, between two and four variables associated with each dimension are shown in Table 2.

Criterion validity was obtained through Pearson's R correlation coefficient. A positive correlation was determined between the DMFT index and each dimension separately and in total, except for the "risk

factors" dimension (Table 3). Positive correlations were found between the individual dimensions and the DMFT index results. However, no significant correlations were found between the total dimensions and the DMFT index (r: 0.13 and p-value: 0.20).

DISCUSSION.

The questionnaire on oral health of the WHO linguistically adapted to Spanish proved to be an instrument that had adequate conceptual, semantic and item equivalence to the original. This is due to the modifications made in relation to the use of hygiene instruments or tools that are not used in the Americas (item 8), and the differences in educational levels among the Chilean population (items 13 and 14).

For the variable Miswak or "natural toothbrush" (item 8), it should be noted that it is a much more popular hygiene instrument in India and Muslim countries,⁶ whose populations are considerably larger in Asia, Europe and North America than in South America. These cultural differences, in addition to the fact that this hygiene instrument is not available in Chile, allow to establish that Miswak as a response option was not relevant for the population in which the adapted questionnaire was applied.

For items 13 and 14 it is necessary to consider that the Chilean educational system is organized as follows: pre-school level, a primary school level consisting of eight years, a secondary school level consisting of four years, and a higher educational level in universities, colleges, professional institutes or technical training centers.⁷ Therefore it was necessary to rethink the options in the questionnaire without changing their meaning, as they are presented in a Likert-scale format, for further evaluation of validity and reliability.

Another change made was the elimination of the "peri-urban area" option in item 1, in order to provide

respondents with an instrument containing clear and defined answers or options. Twelve-year-old respondents may have difficulties in differentiating concepts with similar names (the original questionnaire included the options "peri-urban", "urban" and "rural"), which may cause confusion. According to the 2002 Census, the Chilean population is divided into Urban (86.6%) and Rural (13.4%),⁸ which is the most suitable division according to the country's sociodemographic distribution.

The psychometric characteristics evaluated in the validation analysis of the instrument showed it had moderately satisfactory results in terms of validity and reliability. Regarding reliability, the Cronbach's alpha value for the dimension "Educational level of parents" was 0.67, which is considered acceptable;⁹ while the remaining dimensions had values of 0.57 for health and 0.61 for habits, suggesting that for 12-year-old children it might be better to reduce the number of questions and use a smaller questionnaire to have more integration between the items. It has been observed that with fewer questions and changing score scales, instruments with acceptable reliability can be obtained.¹⁰ It is also important to consider that the reliability of scales or instruments may vary depending on the age of the population. This can produce statistically significant differences in direct proportion and of greater internal consistency as the age of the sample increases, mainly because higher educational levels increase the reliability coefficient.¹¹⁻¹² Therefore the reliability of the instrument could increase if it is applied to children older than 12 years, who are able to answer the questions with more seriousness and with greater concentration.¹¹ However, for this age there are also studies that consider a Cronbach's alpha of 0.6 as acceptable,¹³⁻¹⁵ since it cannot be interpreted in the same way as a study conducted on adults or older adolescents, except in instruments that are already fully validated in other instances.

In the evaluation of the dichotomous variables of item 8, the KR-20 showed a low index of 0.20, which is expected in cases where short tests, with less than 10 questions to be evaluated, are in the case of this item (six questions), since the reliability of a measure is a direct function of the length of the test (number of questions).¹⁶

Regarding criterion validity, the aim was to correlate

the questionnaire with a "gold standard,"¹⁷⁻¹⁸ which in this case does not exist. However, as in the validation study conducted by Haller *et al*, in 2012,¹⁹ a score was assigned to the answers. In this case, those who presented a greater risk of caries could be correlated with the DMFT through Pearson's coefficient, since the evidence considers that the factors linked to cariogenic diet, hygiene habits, visits to the dentist and educational level of the parents are closely related to the "caries history" or DMFT²⁰⁻²⁴ index; therefore a positive correlation can be expected between them. This correlation when evaluated by dimensions and components of DMFT (Table 3) seems to be slightly positive and even negative for the "filled" component in the dimensions of oral health and educational level of the parents; while for the component "missing" there are negative results for all dimensions. For the global DMFT index, correlations seem to be slightly positive for each dimension and for the instrument as a whole; however, these are not statistically significant. All this could be mainly due to the low rate of decayed, filled and missing teeth found in this sample, and that incidentally reflects data from the Region of Valparaíso, which is one of the regions with the lowest DMFT rates in Chile.²⁵ Studies evaluating an older population will tend to find a higher DMFT index, so positive correlations may be stronger and this index could then serve as a method for criterion validity assessment. Therefore it can be suggested that in children the DMFT Index may not be the best option to evaluate the correlation with the factors measured by the questionnaire, so in other studies the oral hygiene index or microbiological tests could be used for criterion validity. In the exploratory factor analysis, the KMO index yielded a value of 0.54, which is considered acceptable to perform a factorial analysis.²⁶ After the varimax orthogonal rotation, 11 factors were found, of which many variables defined different dimensions and, at the same time, others did not define any. Table 2 shows that each variable is associated with one or two factors, but there is no set of variables that relate to one of the factors to become a dimension. Only items 13 and 14, related to the educational level of parents, are strongly associated with factor 7 and item 3 (which includes two variables), on self-reported dental health and gums, which is strongly associated with factor 6.

Regarding factor 4, associations of variables that would be expected to be within a dimension are shown, however, for that dimension it is expected that there were more variables that could explain it and not only three ("Avoid smiling because of your teeth", "Missing classes at school," and "Feeding problems").

These results make us think that the instrument could be multidimensional or that the variables are not being related among themselves to consistently indicate each dimension. Therefore, we must bear in mind that as a general rule, the inclusion of more items will allow to measure a factor with more precision; hence the factor will be more determined and the factorial solution more stable, so a minimum of three or four items by factor is advisable.²⁶ The abovementioned proposal is achieved in the validation of this instrument for factors 3, 4, 5 and 8. Likewise, factor 2 has a single variable that does not allow defining a specific dimension by itself.

Consequently, the factorial analysis reveals an instrument with some well-defined dimensions and other weakly composed only of 1 or 2 variables, when it would be expected to be composed of three or four in order to confirm its multidimensionality. The latter could be due to the method of data collection (self-

report) or to the length of the questionnaire in relation to the age of the subjects (children). It is suggested that the elimination or combination of some variables within each item (mainly 2, 9 and 11) could better define the other dimensions of the construct since, for example, factor 9 includes three component variables, but they do not have a clear relationship with each other as to what they intend to measure.

Within the limitations of the study, there is the use of the self-report method instead of the interview method in order to obtain the answers. It is also necessary to specify as a limitation the lack of a "Gold Standard" instrument to evaluate criterion validity.

CONCLUSION.

The WHO oral health questionnaire for children linguistically adapted to Spanish was found to have an adequate conceptual and semantic equivalence, comparable to the original version and with psychometric characteristics of reliability and validity that allow its use with 12-year-old children.

Based on the abovementioned suggestions, new research is recommended to evaluate the improvement of psychometric characteristics.

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