Evaluation of Psychometric Properties in the Argentine-Adapted Dietary Sodium Restriction Questionnaire in Heart Failure Patients

Adaptación para la Argentina y evaluación de las propiedades psicométricas del Cuestionario sobre la Dieta Restrictiva de Sodio en pacientes con insuficiencia cardíaca

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ABSTRACT

Introduction: The Dietary Sodium Restriction Questionnaire (DSRQ) is based on the theory of planned behavior. Originally developed in English, this instrument, consisting of three subscales (divided in 16 items evaluating the parameters associated with attitude relative to behavior, the subjective norm and the perceived behavioral control), identifies the factors affecting adherence to low-sodium diet in patients with congestive heart failure (CHF).

Objectives: The purpose of this study was to perform the DSRQ transcultural adaptation into Spanish to be used in Argentina and assess its psychometric properties (validity and reliability).

Methods: The transcultural adaptation was done with the recommended methodology (translation, synthesis, revision and back translation). Its validity was explored by principal component structure and factor analysis with factor extraction and Varimax rotation. Reliability was analyzed by internal consistency calculation (Cronbach's alpha) and the scale item-total correlation.

Results: Headlines were adjusted and one question only had relevant semantic changes in the transcultural adaptation. A total of 230 CHF patients were included for the psychometric analysis. The proportion of missing data was very low (0.20%). Three factors were extracted from the principal component analysis. After Varimax rotation, the items were grouped with the selected factors, matching the three original subscales. In the item-total analysis, no correlation showed a value < 0.30. Global Cronbach's alpha was 0.86 (0.89, 0.71 and 0.89 for the three subscales, of attitude relative to behavior, subjective norm and perceived behavioral control, respectively).

Conclusions: We performed for the first time the DSRQ transcultural adaptation into Spanish for its use in Argentina. This version of the instrument showed adequate validity and reliability.

Key words: Questionnaire - Transcultural Adaptation - Validity - Reliability - Heart Failure – Low-Sodium Diet

RESUMEN

Introducción: El Cuestionario sobre la Dieta Restrictiva de Sodio [Dietary Sodium Restriction Questionnaire (DSRQ)] está basado en la teoría del comportamiento planificado. Originalmente desarrollado en inglés, este instrumento, compuesto por tres subescalas (en 16 ítems que evalúan los parámetros vinculados con la actitud en relación con el comportamiento, la norma subjetiva y el control comportamental percibido), identifica los factores que afectan la adhesión a la dieta hiposódica en pacientes con insuficiencia cardíaca congestiva (ICC).

Objetivos: Realizar la adaptación transcultural del DSRQ en idioma español para su utilización en la Argentina y evaluar las propiedades psicométricas (validez y confiabilidad).

Material y métodos: La adaptación transcultural se realizó con la metodología recomendada (traducción, síntesis, revisión y retrotraducción). La validez se determinó mediante análisis de forma y factorial de componentes principales con la extracción de factores y rotación Varimax. El análisis de la confiabilidad se efectuó mediante el cálculo de la consistencia interna (alfa de Cronbach) y la correlación ítem-total de la escala.

Resultados: En la adaptación transcultural se adaptaron los encabezados y solamente una pregunta tuvo alteraciones semánticas relevantes. Para el análisis de las propiedades psicométricas se incluyeron 230 pacientes con ICC. La proporción de datos faltantes fue muy baja (0,20%). En el análisis de componentes principales se extrajeron tres factores. Luego de la rotación Varimax, los ítems se agruparon con los factores seleccionados, coincidiendo con las tres subescalas originales. En el análisis ítem-total, ninguna correlación mostró un valor < 0,30. El alfa de Cronbach global fue de 0,86 (0,89, 0,71 y 0,89 para las tres subescalas, de actitud en relación con el comportamiento, norma subjetiva y control comportamental percibido, respectivamente).

Conclusiones: En nuestro trabajo se realizó por primera vez la adaptación transcultural del DSRQ al español para su utilización en la Argentina; la confiabilidad y la validez de esta versión del instrumento fueron adecuadas.

Palabras clave: Cuestionario - Adaptación transcultural - Validez - Confiabilidad - Insuficiencia cardíaca - Dieta hiposódica

Abbreviations

DSRQ	Dietary Sodium Restriction Questionnaire	**CHF**	Congestive heart failure

INTRODUCTION

The prevalence of congestive heart failure (CHF) in the adult population of developed countries is estimated in 1-2%, reaching ≥ 10% in subjects over 70 years. (1) The low-sodium diet is a non-pharmacological measure often recommended in the management of patients with CHF. (2-4) However, as usually happens with other lifestyle changes, the adherence to a low-sodium diet is often poor. (5, 6) The consequence is not trivial, since dietary transgression is one of the most frequent causes of decompensation in patients with CHF and consequently, of hospital admissions. (7-9)

The Dietary Sodium Restriction Questionnaire (DSRQ) is an instrument developed to identify the factors affecting adherence to the recommendation of low-sodium diet in patients with CHF. (10) The questionnaire, originally developed in English, is based on the theory of planned behavior, and consists of three subscales assessing the parameters associated with attitude relative to behavior, the subjective norm and the perceived behavioral control. The attitude subscale has six items that assess the patient's beliefs about the results of adopting certain behaviors, with a score ranging from 6 to 30. The subjective norm subscale is composed of three items assessing the importance of approval or disapproval of third parties in accomplishing a given behavior, with a score ranging from 3 to 15. Finally, the behavioral control subscale, consisting of seven items, assesses the patient's ability to identify facilitators and barriers relative to the behavior, with a score that is inverted and varies from 7 to 35.

The DSRQ has been adapted into Brazilian Portuguese. (11)

Moreover, the psychometric properties of the questionnaire adapted to Portuguese have been previously analyzed and published. (12) To date, the questionnaire has not been adapted into Spanish for its use in our country.

Taking into account the considerations mentioned above, the aims of this study were: 1) to perform the DSRQ transcultural adaptation into Spanish to be used in Argentina 2) to assess its psychometric properties (validity and reliability).and 3) to evaluate the questionnaire results according to certain characteristics of the population, such as gender, left ventricular function or functional capacity.

METHODS

Internationally recommended methodological guidelines were followed to develop the transcultural adaptation and analyze the psychometric properties of the instrument. (13, 14)

Clinical data such as age, educational level, functional capacity or left ventricular systolic function were collected, as well as questionnaire administration.

Transcultural adaptation

The first step in the process of transcultural adaptation was translation of the original instrument, with prior permission of the author. Sixteen items of the three subscales were evaluated. In addition to these items, the DSRQ presents 11 items whose response provide information on low-sodium diet prescription, follow-up of this recommendation and the degree to which the low-sodium prescription is believed to help control the disease. These items were not included in the analysis as the information was not associated to the instrument subscales and were strictly descriptive. Two translations were made by bilingual translators whose mother tongue was Spanish. Using the translated versions, the research team, together with the translators, reviewed the items, instructions and answers to generate agreement on a first version. Understanding the translated instrument content was explored in a second phase, assessing whether the vocabulary was adequate and the items were culturally applicable, with groups of discussion among experts and semi-structured individual interviews. Subjects of different age, sex and cultural level (maximum level of education reached: primary, secondary or tertiary) participated in the interviews. In addition, document agreement was provided by a Bachelor of Science in Communications. After this stage, a second version of the instrument was built.

Finally, in a third stage, back translation to the original language was performed by two translators whose mother tongue was English. Researchers verified and discussed whether the versions obtained reflected the initial content of the instrument and the final version was submitted to the authors of the original questionnaire.

Evaluation of psychometric properties

Once the transcultural adaptation ended, the psychometric properties were tested in a larger sample of the population of interest. Cardiology outpatients from 6 centers of the Autonomous City of Buenos Aires and Greater Buenos Aires, > 18 years, with clinical diagnosis of CHF or history of left ventricular dysfunction, able to read and understand a questionnaire, and who were not decompensated at the moment of the survey were included in the study.

Questionnaire validity was analyzed using the following procedures:
- Form analysis: this qualitative analysis was explored through a general reading of the instrument. Response distribution, identification of the ceiling or floor effect and the participation and no response patterns were examined.
- Content analysis: this was performed in all the collected surveys by principal component factorial analysis with factor extraction and Varimax rotation. Criteria for factor extraction were an Eigenvalue > 1, an accumulated percentage of explained variance > 70% or through graphical representation (Scree test).

The reliability analysis was performed with the following procedures:
- Dimensional homogeneity analysis: it calculated the internal consistency of the questionnaire and of each dimension with Cronbach´s alpha coefficient. A value be-

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tween 0.70 and 0.90 was considered as adequate.
- Analysis of scale item-total correlation: this is the correlation of each individual variable against the average of the remaining variables. Correlation values > 0.3 were considered to be adequate.
- Continuous variables were expressed as mean ± standard deviation and categorical variables as percentages.

Student´s t test was used to compare continuous data between two groups.

Ethical Considerations
The study included a signed informed consent form following the recommendations in medical research established by the Declaration of Helsinki, Good Clinical Practice Guidelines and current ethical regulations.

RESULTS
Transcultural adaptation
The two translations were analyzed and an initial version was built among the group of investigators. The final version for back translation was obtained after analyzing concepts, verifying the quality of contents, observing the use of daily language and establishing the difficulty of patients to understand the choice of answers (words with difficult meaning, alternative phrasings). In this last phase, coherence between the translated and back translated versions, focused on semantic, idiomatic and conceptual matching, was verified to produce the final version (Annex).

The five-point Likert scale was used to score each question. In the original instrument, the attitude and subjective norm scales explore how far the patient agrees or disagrees with each item, where 1 corresponds to "strongly disagree" and 5 "strongly agree". In our version, options 1 to 5 were adapted to "I do not agree", "I somewhat agree", "I agree", "I quite agree", and "I strongly agree".

In the behavioral control scale, rating indicates how much the items stop them from following a low-salt diet, where 1 corresponds to "not completely" and 5 to "completely or very much". In our version of the questionnaire, options 1 to 5 were adapted to "It does not stop me at all", "Almost does not stop me", "it somewhat stops me", "It quite stops me", "It strongly stops me".

Among the instrument items, only question 10 evidenced relevant semantic and/or cultural alterations, since in the proof of concept it generated understanding complications.

Evaluation of psychometric properties
This analysis included 230 patients. Mean age was 66.5 ± 13.3 years and 70% were men. Prevalence of primary, secondary or tertiary/university education was 40.8%, 30.6% and 28.6%, respectively. Sixty one percent of patients had left ventricular dysfunction (48% with severe dysfunction) and 44.4%, 41.6%, 13.5% and 0.5% were in functional class I, II, III or IV, respectively.

Men and women exhibited a similar average score in the attitude relative to behavior (23.5 ± 5.6 vs. 24.1 ± 5.0; p = 0.47), subjective norm (11.0 ± 2.3 vs. 10.9 ± 2.3; p = 0.91) and perceived behavioral control (16.1 ± 5.9 vs. 14.7 ± 6.1; p = 0.12) subscales. Subjects with left ventricular function impairment showed better score in the subjective norm subscale (11.2 ± 2.2 vs. 10.5 ± 2.4; p = 0.04) compared to subjects with preserved left ventricular function, and not significant differences were found for the other two subscales. When patients were analyzed according to their functional class, those in class III-IV had a higher score in the attitude subscale (25.4 ± 5.1 vs. 23.7 ± 5.4; p = 0.03) and in the subjective norm subscale (11.1 ± 2.2

Question	Option 1 (%)	Option 2 (%)	Option 3 (%)	Option 4 (%)	Option 5 (%)
1	1.74	6.52	17.39	21.30	53.04
2	3.48	7.39	21.30	17.83	50.0
3	3.48	10.87	19.57	20.43	45.65
4	6.09	11.30	21.30	22.61	38.70
5	5.65	7.39	17.39	27.83	41.74
6	2.17	3.48	9.57	22.61	62.17
7	0.43	3.48	44.35	23.04	28.70
8	0.87	3.48	43.91	25.22	26.52
9	6.09	5.65	49.13	25.22	13.91
10	44.54	19.21	19.65	11.35	5.24
11	30.87	23.91	20.43	13.91	10.87
12	29.69	24.45	24.02	15.28	6.55
13	29.57	26.09	21.30	16.52	6.52
14	35.24	18.06	21.59	17.62	7.49
15	19.65	23.58	17.47	20.96	18.34
16	39.13	20.00	18.26	15.65	6.96

Table 1. Distribution of answers in the 16 questions of the questionnaire
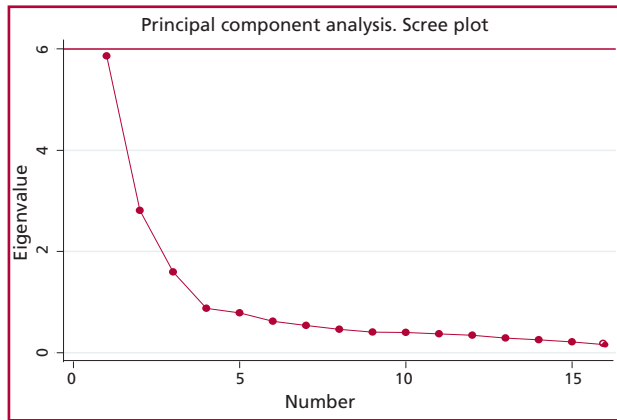
Fig. 1. Scree plot illustrating factors according to the Eigenvalues. The first three points at the left represent extracted factors with Eigenvalues of 5.86, 2.81 and 1.60, respectively.

vs. 10.3 ± 2.3; p = 0.01), and a lower score in the perceived behavioral control subscale (12.7 ± 6.3 vs. 15.9 ± 6.0; p < 0.001) compared with subjects in class I-II.

Validity analysis

Form analysis: the questionnaire was globally analyzed to qualitatively assess the degree in which the intended purpose measured by the instrument was correct. The distribution of the different item answers are shown in Table 1. The ratio of missing values was very low (0.20%). No "floor" or "ceiling" effect was observed in any of the items evaluated.

Content analysis: three factors were extracted after the analysis of principal components (Figure 1), with Eigenvalues of 5.86, 2.81 and 1.60, respectively, representing 64% of accumulated variability. The percent variability of each item unexplained by the factors was low in all cases (uniqueness).

After performing Varimax rotation, factor 1 showed high factorial loads for most of the items forming the perceived behavioral control subscale, factor 2 showed elevated factorial loads for attitude subscale

items related with behavior and, finally, factor 3 was associated with items conforming the subjective norm subscale (Table 2).

Reliability analysis

Item-total correlation analysis: no correlation values were < 0.30. Item-total correlations for every question of each subscale are detailed in Table 3.

Internal consistency analysis: global Cronbach´s alpha coefficient of the instrument was 0.86. Moreover, Cronbach´s alpha coefficient of the attitude subscales relative to behavior, subjective norm and perceived behavioral control were 0.89, 0.71 and 0.89, respectively.

DISCUSSION

The analysis of factors that influence the adherence to a low-sodium diet in patients with CHF is no simple task. (15, 16) In this context, the DSRQ developed in the United States for this purpose is a useful tool. However, the original questionnaire is written in another language and was drawn from another population. The questioning method and language used are sources of bias, while different cultural factors can make the same question either valid or not depending on the language, or even on different countries sharing the same language. In our work the DSRQ transcultural adaptation into Spanish was performed for the first time for its use in Argentina.

After adjustment, the new version of the instrument should be checked to see whether it keeps the adequate psychometric characteristics of the original version. The methodological quality is essential to ensure that the results obtained in the study can be properly interpreted and used in clinical practice. In that sense, our work met the established methodological recommendations. (14)

In our analysis, the internal consistency of the adapted instrument was very good. The original questionnaire showed Cronbach's alpha coefficient values slightly below the ones found in our work for the three subscales (0.88, 0.62 and 0.76 vs. 0.89, 0.71 and 0.89).

Table 2. Principal component analysis. Varimax rotation

Question	Factor 1	Factor 2	Factor 3	Uniqueness
1		0.747		0.366
2		0.793		0.280
3		0.824		0.265
4		0.756		0.405
5		0.823		0.313
6		0.785		0.367
7			0.764	0.393
8			0.845	0.276
9			0.718	0.442
10	0.752			0.408
11	0.770			0.339
12	0.755			0.355
13	0.729			0.430
14	0.819			0.321
15	0.810			0.329
16	0.739			0.434

Table 3. Reliability analysis. Corrected item-total correlation

Items	Scale item-total correlation
Attitude subscale	
Question 1	0.68
Question 2	0.77
Question 3	0.79
Question 4	0.67
Question 5	0.71
Question 6	0.67
Subjective norm subscale	
Question 7	0.50
Question 8	0.61
Question 9	0.46
Behavioral control subscale	
Question 10	0.67
Question 11	0.72
Question 12	0.72
Question 13	0.65
Question 14	0.74
Question 15	0.73
Question 16	0.65

(10) Similarly, the values found in the Spanish adaptation were higher than those in the Portuguese adaptation made for Brazil (0.66, 0.50 and 0.85). (12)

On the other hand, the item-total correlation coefficient was over 0.30 in all items (all of them above 0.40), which is more than acceptable, confirming instrument homogeneity

The differences found with the original instrument, and even with the adaptation made in Brazil, in some questions of the three subscales could be due to cultural and demographic issues of the different populations assessed, since many of the population characteristics impact on knowledge and adherence to a low-sodium diet. For example, our population showed a higher proportion of men (70% vs. 56.5%) and older age (66.5 ± 13.3 vs. 62.4 ± 13.5 years) compared to the target population in the original questionnaire. Previous studies have shown that both women and the most severely ill patients adhere better to non-pharmacological recommendations. (17, 18) In our study, and applying the questionnaire as a tool to identify barriers to adherence, we have found no gender differences except in subjects with more severe CHF, either evaluating systolic left ventricular function (subjective norm subscale) or analyzing the functional class (in the three subscales).

Independently of form validity, which is entirely subjective, when performing content validity we found similar results compared to the original instrument. Factor analysis is a method that aims to examine the structure of the relationships between variables (items). Although there are different techniques to perform this work, we selected the principal component analysis which is the one most frequently used. As in the original version, and based on Eingenvalues and Scree plot, our analysis also extracted three main factors that had a good correlation with the domains or subscales previously established in the original questionnaire.

Clinical Implications

Self-care behavior in patients with CHF may vary considerably according to the country evaluated. (19) Having a questionnaire adapted and validated in our country to quantify issues relative to the adherence of dietary sodium restriction in patients with CHF is important in order to develop and implement local research studies. For example, Welsh et al. (20) used the DSRQ to quantify the impact of an educational intervention on the improvement of patient barriers to comply with a low-sodium diet. Similarly, Heo et al. (21) used the instrument to assess the modifiable factors associated with perceived behavioral control, and therefore life quality of patients with CHF, with the intention of guiding the development of future interventions.

The use of this new tool validated in our country will minimize information bias that may be associated with the use of questionnaires in countries with different languages and cultures.

CONCLUSIONS

In our work the DSRQ transcultural adaptation into Spanish was performed for the first time for its use in Argentina. According to our analysis, the reliability and validity of this version of the instrument was adequate, allowing its use in future local researches.

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ANNEX. Questionnaire adaptation into Spanish for its use in Argentina

A) For each of the points indicate how much you agree with the following statements by circling the appropriate number on the scale on the right. To do this, use the following scale:

I do not agree 1	I somewhat agree 2	I agree 3	I quite agree 4			I strongly agree 5	
1. It is important for me to follow a low-salt diet.			1	2	3	4	5
2. Eating a low-salt diet will prevent fluid from building up in my body.			1	2	3	4	5
3. Eating a low-salt diet will keep my swelling down.			1	2	3	4	5
4. Eating a low-salt diet helps me breathe better.			1	2	3	4	5
5. When I follow a low-salt diet, I feel better.			1	2	3	4	5
6. Eating a low-salt diet will keep my heart healthy.			1	2	3	4	5
7. My spouse or other family members think I should eat with little salt.			1	2	3	4	5
8. Generally, I want to do what my doctor thinks I should do.			1	2	3	4	5
9. Generally, I want to do what my spouse or other family members think I should do.			1	2	3	4	5

B) Indicate how the following situations stop you from sustaining a low-salt diet, by circling the appropriate number on the scale on the right. To do this, use the following scale:

It does not stop me at all 1	Almost does not stop me 2	It somewhat stops me 3	It quite stops me 4			It strongly stops me 5	
10. I do not know how to follow a low-salt diet and/or do not understand how.			1	2	3	4	5
11. The reduced taste of low-salt foods.			1	2	3	4	5
12. I can't pick out low-salt foods in restaurants.			1	2	3	4	5
13. The restaurants I like do not serve low-salt foods.			1	2	3	4	5
14. I find it difficult to choose low-salt foods in the supermarket.			1	2	3	4	5
15. The foods I like to eat are not low-salt.			1	2	3	4	5
16. I lack the willpower to change my diet.			1	2	3	4	5