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ORIGINAL ARTICLE

Validity of the Suicide Behaviors Questionnaire-Revised in patients with short-term suicide risk

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Abstract
Background and objectives: Suicide is known as a public health problem; however, there are few validated scales with no predictive validity. The aim of this study was to assess the validity of the Spanish version of The Suicidal Behavior Questionnaire-Revised in patients with suicidality.
Methods: We applied the Spanish version of The Suicidal Behavior Questionnaire-Revised and 2 other scales to patients with suicide risk. Thirty days later we reassessed to determine the predictive validity for suicide attempt or suicide.
Results: 484 patients with suicidality were screened of which 417 were eligible and 411 were evaluable. Factor analysis found a domain with an eigenvalue of 2.0 explaining 50.1% of the variance. With a cutoff point $\geq$11 the NPV was 98.3% (IC95%, 95.2–99.6) and the PPV was 8.7% (IC95%, 4.7–14.4).
Conclusion: The Spanish version of The Suicidal Behavior Questionnaire-Revised, similar to the English version, has moderate internal consistency, adequate concurrent validity and predictive validity.

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Introduction

Suicide is a public health problem that can be prevented. The overall annual suicide rate at standardized age was 11.4 per 100,000 individuals (15 for men and 8 for women). However, it is thought to be an undervalued figure given that suicide is a sensitive subject, even illegal in some countries, therefore not always reported. Additionally, in countries where it is adequately reported, it is frequently misclassified as accidental death or other causes of death.[1]

In 2015, the legal medical system in Colombia reported a suicide death rate of 5.2 cases per 100,000 individuals older than 5 years, approximately 28% higher than the average rate over the last nine years.[2,3]

In low and middle-income countries, suicide risk assessment is difficult because of the lack of trained personnel in the general practice and emergency services. In 2014, the World Health Organization reported that in Colombia there are 2.5 psychiatrists per 100,000 individuals.[4] Due to the scarce amount of psychiatrists in general hospitals, appropriate medical care is often delayed in this patient population.

In order to reduce the incidence of suicide and suicidal behavior, it is necessary to generate effective prevention strategies based on the early detection and suicide risk assessment. Both risk factors and protective factors should be evaluated and determined by trained personnel through an interview. At the same time, it is necessary to apply instruments that enhance the effectiveness of health care delivery for patients at risk of committing suicide. Self-reported scales and tools have proven to be a good alternative for this evaluation in emergency and outpatient settings, since they are time-effective and easily administered.[5,6]

There are different scales used to evaluate and classify the patient with suicidal risk. Including The Suicide Behaviors Questionnaire Revised (SBQ-R), only three brief measures met all criteria and demonstrated adequate psychometric properties.[7] The SBQ-R scale is a 4-item tool that evaluates past and future suicidal thoughts and behaviors. It not only favors the psychiatrist to consider suicide risk in a short time, but it also allows an easy applicability by other health personnel to differentiate patients who require further attention. One benefit of self-reported instruments, beyond cost and easy administration format, is the ability to obtain objective information from individuals who may have difficulty expressing suicidal thoughts.[8]

The objective of this study is to assess the validity of the SBQ-R in Spanish to consequently approve a brief, effective and efficient tool that allows physicians who are confronted with suicidal risk identification and risk assessment to properly intervene.

Methods

A validation study of a diagnostic test was performed. The study was approved by the research ethics committee of the faculty of health sciences of the Universidad Autonoma Bucaramanga. Written informed consent was requested from all participants prior to the start of the study, in accordance with current Colombian health research standards and the Helsinki Declaration.[9,10]

Instruments

The SBQ is a self-report instrument created by Linehan et al. in 1981. The original instrument consisted of 34 items; later two versions were made, one consisting of 4 items and one of 14 items. The scale is composed of questions regarding past and future suicidal thoughts and behaviors. The SBQ-R is an abbreviated version of 4 items and consists of Likert-type questions on the frequency of presentation of suicidal ideation, communication of suicidal thoughts to others, and attitudes and expectations about the current suicide attempt. The specific items are: ''Have you ever thought about or attempted to kill yourself?'' (Score: 1 to 4), ''How often have you thought about killing yourself in the past year?'' (Score: 1 to 5), ''Have you ever told anyone you were going to commit suicide, or that you might do it?'' (Score: 1 to 3) And ''How likely is it that you will try to kill yourself someday?'' (0 to 6). The total score ranges from 3 to 18 and the time invested in performing the scale is approximately 5 minutes.[11] The use of the test was globalized without reaching a consensus of a unified validation to apply in youth and adults in both intrahospital and outpatient settings from different cultures and lenguages.[12,13]

The Reasons for Living Inventory (RFL) is a questionnaire consisting of 48 items, graded on a six-point Likert scale, evaluating different kinds of reasons for living and the endorsement of different types of beliefs. The factors analyzed are divided into domains and indicate the six main reasons for living: beliefs of survival and coping (24 items); Responsibility to family (7 items); Child related concerns (3 items); Fear of suicide (7 items); Fear of social disapproval (3 items) and moral objections (4 items).[14]

Beck's Hopelessness Scale (BHS) is a self-report scale consisting of 20 statements that can be defined as true or false, assessing the extent of negative expectations regarding the immediate and long-term future. The answers are summed to give a score ranging from 0 to 20. Items indicating despair are scored with 1 point; those who do not indicate despair qualify with 0 points.[15] It's important to mention that the RFL scale and the BHS are already validated for Spanish population.[16,17]

Translation

Two native authors fluent in both languages translated the scale from English to Spanish and compared their products. The resolution of the differences between the original and the translations was made by a new native translator. The SBQ-R scale in Spanish was again translated into English by a bilingual physician without knowing the scale in its original language. The research group reviewed the conceptual overlap of each item. A pilot test was performed using the translated, final and corrected version of the SBQ-R in Spanish on 10 patients who understood the instrument adequately.

Study population

All patients over 15 years old who presented to the emergency department in a psychiatric private clinic with suicidality were screened for eligibility. A patient with suicidality was defined as anyone who presented suicidal thoughts, ideas or plans and suicidal behaviors or attempts.[18] All patients who voluntarily agreed to participate in the study and who reported suicidality according to their treating physician were included. Those with psychosis or patients who could not respond adequately to the questionnaire do to their level of education were excluded.

To enhance patient accrual, once the treating psychiatrist detected a patient with suicidality, he checked a predetermined box in the electronic medical record that allowed identification of a potential subject from the research team.

Sample size

The sum of the four items of the SBQ-R was taken for the calculation of the sample size. The recommendation to recruit 10 patients for each item to find the construct validity was considered, in this case, 40 patients at minimum.[19] For predictive validity, an incidence of 10% of suicide attempts or completed suicides was taken into account. A negative predictive value (NPV) of 0.95 and a positive predictive value (PPV) of 0.2; a level of significance of 0.05 and a power of 0.8 for a minimum of 500 patients.

Procedure

All patients were interviewed by one of the investigators with previous training in suicidal risk assessment. A semi-structured interview created by the authors was conducted with the aim of systematizing the evaluation of suicidal risk. This interview classified suicide risk according to the risk or protective factors and the structure of the suicidal idea in low, moderate, high, high-immediate. After the interview, one of the investigators instructed the patient to answer the SBQ-R, the RFL inventory, and the BHS.

A researcher performed short-term follow-up 30 days later the presence of suicide attempt or completed suicide was established. The greatest risk for a suicide attempt or completed suicide is at the first 30 days after discharge.[20,21] A maximum of three attempts at reaching the subjects were made before declaring them as lost to follow up.

Statistic analysis

SBQ-R was manually revised, stored in duplicate, and processed in STATA (version 10.0).[22] To describe the demographic characteristics of the participants, frequencies and percentages were used in the qualitative variables, and means and standard deviations in the quantitative variables. The Bartlett sphericity test was used to test the hypothesis that the obtained correlation matrix is not an identity matrix. Also the Kaiser-Meyer-Olkin index (KMO) was used. For construct validity an oblique factor analysis (Promax) was performed.[23] To find the internal consistency, the

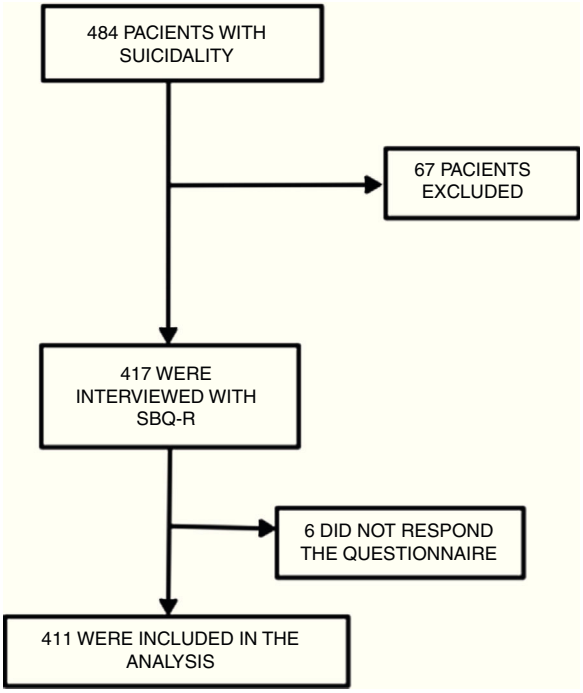

Figure 1 Flowchart.

Cronbach's alpha coefficient was calculated in the SBQ-R.[24] For predictive validity, PPV and NPV were found, defining the best Cutoff point based on the area under the ROC curve.[25] For Convergent Validity, depending on the case, the Spearman or Pearson correlation coefficient was used.

Results

A total of 484 patients with suicidality were screened, of which 417 met eligibility criteria and were interviewed. Of the interviewees, 6 patients were excluded because they did not respond adequately to the questionnaire (Fig. 1). The sociodemographic characteristics of the excluded patients did not show a significant difference in relation to the included population, except for the level of education, which was the most prevalent reason for exclusion. The majority of participants were women; the mean age was 30.1 years $\pm$ 13 with a schooling of 11.2 years $\pm$ 3.5 [2–22]. Table 1 shows the sociodemographic characteristics of the population. Table 2 shows the diagnoses of patients with suicidality. The mean SBQ-R score was 10.1 $\pm$ 3.6 [1–18]. For females the mean total was 10.5 $\pm$ 3.6 [3–18] and for males 9.5 $\pm$ 3.6 [1–18]. There were no completed suicides after the first month of follow up. The incidence of suicide attempts in the first month was 4.8% [IC 95% 2.49–7.10].

Analysis of factors

Bartlett's sphericity test was statistically significant ($X2 = 304.6$, gl = 6, $p < 0.001$). The adequacy test of the KMO sample was good (0.7). The analysis of factors by oblique rotation (Promax) found a domain with an eigenvalue of 2.0 explaining 50.1% of the variance.

Table 1 Sociodemographic variables of patients with suicidality.

Variable	*N*	%
Gender		
Female	262	63.8
Status		
Low	107	27.3
Middle	263	67.1
High	22	5.6
Marital status		
Single	193	47.1
Married	91	22.2
Civil Union	60	14.6
Widowed	8	2.0
Divorced	58	14.1
Work status		
Student	122	29.8
Employed	176	43.0
Unemployed	53	13.0
Temporary job	10	2.4
Housewife	29	7.1
Retired	8	2.0
Others	11	2.7
Number of children		
0	188	46.1
1	84	20.6
2	73	17.9
3	40	9.8
>4	23	5.6
Lives with		
Alone	28	6.8
Family	329	80.1
Other family members	44	10.7
Institution	7	1.7
Others	3	0.7
Religion		
Atheist	9	2.2
Unaffiliated	92	22.5
Catholic	257	62.8
Other Christians	47	11.5
Others	4	1

Table 2 Major diagnoses of patients with suicidality.

Diagnosis	*N*	%
Major depressive disorder	233	57.4
Bipolar disorder II	67	16.5
Adaptive disorder	53	13.1
Bipolar disorder I	16	3.9
Post traumatic stress disorder	7	1.7
Generalized anxiety disorder	3	0.7
Obsessive compulsive disorder	3	0.7
Panic disorder	2	0.5
Others not specified	22	5.5
No major diagnosis	5	1.2

Internal consistency

The Cronbach's alpha for the total SBQ-R was 0.64.

Concurrent validity

We found a positive correlation with BHS (Spearman 0.48, $p < 0.001$) and suicide risk assessed by the investigators (Spearman 0.36, $p < 0.001$). The correlation with the RFL inventory was negative (Spearman −0.48, $p < 0.001$).

Predictive validity

The area under the ROC curve was 0.74 (95% CI, 0.60–0.85). In this population the best cutoff point was ≥11. With this cut-off point the NPV was 98.3% (95% CI, 95.2–99.6) and the PPV was 8.7% (95% CI, 4.7–14.4). The RR for suicide attempts in patients with suicidality with scores ≥11 was 5.2 (95% CI 1.5–18.2).

Discussion

The Spanish version of the SBQ-R presents a domain, like the original version, with moderate internal consistency, adequate concurrent validity and a useful predictive validity for detecting patients at low risk of suicide in the next month after administration.

The two versions of the SBQ-R, both 14 and 4 items, have been unidimensional in factor analysis.[11,26] This is not surprising, considering that all SBQ-R questions refer to suicidal plans or behaviors in the past or the future. In this study, we also found a single factor that explains more than 50% of the variance, in compliance with the Streiner maxim and thus confirming that the SBQ-R maintains its factorial structure in the Spanish version in patients with suicidality.[27] It would seem contradictory that a behavior of such complex origins could be evaluated with a single factor. However, as Nunnally observes, in such cases it is preferable to construct a homogeneous instrument to have a pragmatic result.[28]

The internal consistency of the SBQ-R indicates that its items maintain a moderate degree of interrelation in a population with severe mental disorders. Ideally, the Cronbach's alpha is between 0.8 and 0.9, however this coefficient is influenced by the number of items, so that 0.64 may be acceptable on a scale of 4 items.[24] Cotton and colleagues applied the SBQ-R to a population with mental disorders in outpatient management and to the student population, showing that it had adequate internal consistency in the population with mental disorders in an outpatient setting (Cronbach's alpha 0.75) and in healthy students (0.80).[12] Cronbach's alpha coefficient is an inherent property of the population response, not a feature of the scale. One possible explanation is that SBQ-R has a better internal consistency in healthy populations and appears to decrease according to the severity of mental disorders.

As expected, SBQ-R showed a positive correlation with BHS, a scale that has been successfully evaluated to predict future suicide attempts.[29,30] It was also positively correlated with suicide risk assessed by suicide-trained psychiatrists. On the other hand, it presented a divergent correlation with

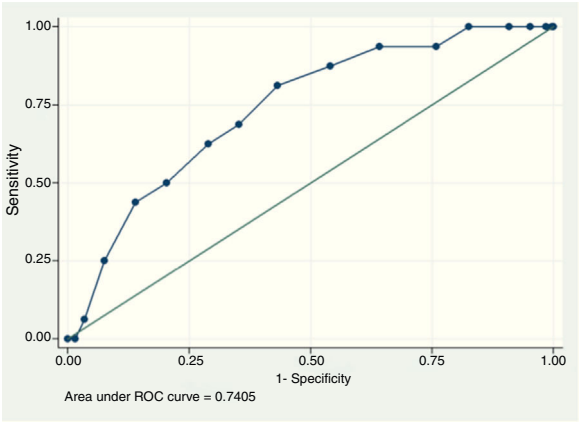

Figure 2 ROC curve.

RFL, since this scale is constructed with positive statements toward life, children, family or religion.[14,16] These findings are similar to those documented in the literature; Cotton and colleagues found that the SBQ had a negative correlation with the RFL (r: −0.35, $p < 0.000$) and a positive correlation with the suicidal ideation scale (r: 0.69, $p < 0.000$).[12]

Up to this point it is clear that the performance of the test and the psychometric properties are adequate as shown in previous studies. However, none of them had assessed the predictive validity. It is important to mention that predictive validity is often associated with problems and practical results. Many of these problems and decision making are related, as in this case, to fundamental steps of clinical practice; the predictive criterion is not falsifiable (suicide or suicide attempt), it is significant and relevant to make decisions. This study evaluates the SBQ-R in its predictive validity, although the area under the ROC curve is barely acceptable, the negative predictive value can, with high precision, indicate the clinician that there is a patient with suicidality but with a low probability of attempting suicide in the following month (Fig. 2). However, the PPV was very low, which indicates that if the SBQ-R is greater than or equal to 11, the test does not adequately predict if the patients with suicidality will attempt it. Thus, these patients should have a more complex assessment before making a clinical decision. Historically, a single cutoff point had been established to differentiate patients with suicidality from those who did not present suicidality. In this criterion validation, the cut-off point was 8 in both adolescents and American adults. Nonetheless, this study is not comparable with the present study, since our intention was to establish a cut-off point that predicted suicide attempts or suicide in patients previously diagnosed with suicidality.[12]

The first work for the predictability of suicide through scales was made by Beck.[31] After applying BHS and continuing follow-up for 43 months, the authors found a NPV of 96.6 and PPV of 2.3 for suicide. A similar study with the BHS found an NPV of 98.4 and PPV of 14.8% for suicide attempt, with a ROC curve of 0.78.[17] Other scales such as the Columbia-Suicide Severity Rating Scale and the Suicide Trigger Scale-3 showed ROCs of 0.76 and 0.73 for suicide attempts and suicide after 6 months of follow-up.[32,33] The different scales demonstrate an acceptable and similar ROC curve, adequate VPN but disappointing VPP, however the SBQ-R is shorter and therefore has a faster application.[17,32,33]

Sample size is a strength in factorial analysis, internal consistency and concurrent validity. However, due to the rarity of the outcome (suicide or suicide attempt), the RR for suicide attempts in patients with suicidality with scores $\geq$11 has a very large CI. This demonstrates a weakness in the results, which became more evident because the calculation of the sample size was performed with an expected incidence of 10% and in the actual results the incidence was lower. Another weakness was follow-up time; although the first 30 days were recognized as the most prevalent period for suicide and suicide risk, medium- or long-term follow-up was desirable in view of the low incidence of suicide.[20,21]

The psychometric properties found in this study indicate that SBQ-R is a valid instrument in Spanish-speaking patients with suicidality, measuring suicidal behavior and plans. However, it only predicts the behavior of those who will not attempt to commit suicide and fails to predict suicidal behavior. This instrument could be a useful tool in primary care and in scenarios where patients do not have access to specialized help. Patients with scores below 11 could be treated at low levels of complexity and only those with scores equal or higher than 11 could be considered for referral to a specialized institution. However, the SBQ-R should be carefully applied according to the type of population, since the psychometric properties of the scale may vary based on cultural and linguistic factors. Therefore, the cut-off point may be different in other Spanish-speaking countries. Further studies with longer follow-up are required.

Conflict of interest

The authors have no conflict of interest to declare.

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