Original Article

Brucellosis Prevention Questionnaire (BPQ): Adaptation to Turkish Culture, Validity and Reliability Study

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Abstract

Background: Brucellosis is the most common zoonosis worldwide. Prevention of brucellosis is based on surveillance and prevention of risk factors. **Aim:** The aim of this methodological study, conducted with breeders living in Kütahya, was to perform the Turkish adaptation, validity and reliability study of the Brucellosis Prevention Questionnaire (BPQ). **Methods:** This methodological study was conducted on breeders living in the villages of Kütahya in Türkiye between May and November 2021. Cultural adaptation–language validity and construct (concept) validity of the scale were evaluated. Item total score correlation, internal consistency, and test–retest correlation was used to evaluate the reliability of the scale. **Results:** According to factor analysis, the variance explained in the five-dimensional structure was 61.8%. A positive correlation was found between the mean BPQ score and Health Perception Scale scores (r = 0.170; P = 0.005). Cronbach's alpha coefficient of the BPQ was found to be 0.944. **Conclusion:** Findings from validity and reliability studies show that the Turkish version of the BPQ is a valid and reliable scale in Turkish society and culture.

Keywords: *Brucellosis, prevention, reliability, scale, validity*

Introduction

Brucellosis is a zoonotic infection that is transmitted to humans from infected animals such as cattle, sheep, goats, camels and pigs, through the ingestion of products such as unpasteurized dairy products or through contact with their tissues and fluids. Brucellosis is the most common zoonosis worldwide.[1] Although great progress has been made in the control of the disease in many countries, it remains an important public health problem.[1,2] The persistence of brucellosis as a public health hazard is explained by the expansion of animal industries and urbanization and the lack of hygienic measures in livestock and food processing.[1] Endemic areas of brucellosis include Mediterranean countries, the Middle East, Central Asia, China, India, sub-Saharan Africa, and parts of Mexico and Central and South America.[3,4] Being the most common bacterial zoonotic infection in Türkiye and observed in all regions, Brucellosis is more common in Eastern and South-eastern Anatolia.[5] Brucellosis is an occupational disease among shepherds, abattoir workers, veterinarians, dairy industry professionals, and laboratory staff.[1] Brucellosis also affects livestock, causing high economic losses in many countries around the world.[6]

There is no vaccine for the prevention of brucellosis in humans.[2] Prevention of brucellosis is based on surveillance and prevention of risk factors.[1] The inability to control brucellosis in animals is regarded as one of the most important reasons for the increasing incidence.[7] Therefore, controlling the disease in livestock and training breeders are considered important strategies to prevent human infection.[2]

Insufficient awareness of breeders about brucellosis infection or misinformation about preventing the disease are the most important obstacles in the prevention of brucellosis. Training of breeders is considered one of the most effective approaches to overcome the barriers

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to brucellosis vaccines.[8] Developed by Bahadori *et al*.,[9] the Brucellosis Prevention Questionnaire (BPQ) is a self-administered questionnaire to examine the awareness, attitudes, and practices of breeders regarding the prevention of brucellosis by vaccination. It was developed for veterinarians and training planners to identify factors influencing the preventive behavior of breeders. This study aims to perform the Turkish adaptation, validity, and reliability study of the BPQ, on a sample of breeders in Kütahya.

Materials and Methods

This methodological study was conducted on breeders over the age of 18 years living in the villages of Kütahya province in western Türkiye between May and November 2021. The sample size was determined to be at least 250 people, five times the number of items on the scale.[10] Kütahya Health Sciences University Ethics Committee for Non-Interventional Clinical Research approval (Decision No: 2021/08-14 Date: 28.04.2021) and necessary official permissions were obtained for the research. The research was conducted in accordance with the Helsinki Declaration.

The data were collected by the researchers through face-to-face interviews with the participants using a questionnaire form involving the sociodemographic characteristics of participants and questions from "Brucella Prevention Scale" and "Health Perception Scale." Participation was on a voluntary basis.

Health Perception Scale (HPS): The Likert-type scale developed by Diamond *et al*.[11] (2007) has 15 items and 4 sub-factors "Locus of control," "Self-awareness," "Precision" and "Importance of health." Each item in the scale is answered as "strongly agree (5)," "agree (4)," "undecided (3)," "disagree (2)," "strongly disagree (1)." Negative statements in the scale were scored reversely. The minimum score that can be obtained from the scale was 15, whereas the maximum score was 75. The lowest scores that can be obtained from the locus of control, self-awareness, certainty, and importance of health subscales were 5, 3, 4, and 3, and the highest scores were 25, 15, 20, and 15, respectively. Turkish validity and reliability of the scale were determined by Kadıoğlu and Yıldız (2012).[12] Cronbach's alpha value of the scale was 0.70.

Brucella Prevention Questionnaire (BPQ): Developed by Bahadori *et al.*, the scale consists of 59 items and 5 subsections as direct awareness (18 items), indirect awareness (10 items), vaccine-oriented awareness (14 items), attitude (9 items), and practice (8 items). With 1 point awarded for each correct answer, 42 items of the awareness sub-domain are answered as "yes" or "no." With the Likert-type answer options provided for sub-areas of attitude and practice, the 17 items are answered as "strongly agree (5)," "agree (4)," "undecided (3)," "disagree (2)," and "strongly disagree (1)." There were no reverse-scored expression in the scale. Scores from each subsection were evaluated separately.[9]

Within the scope of permission to use the scale obtained from Ghofranipour via e-mail, because the scale was adapted to different languages and cultures, changes were made in the expressions and response options for cultural adaptation.[13] Response options for the scale items ("totally agree," "agree," "undecided," "disagree," and "strongly disagree") were formed in the form of a 5-point Likert-type scale with a score from 1 to 5, starting with the "strongly disagree" category.

Validity and reliability studies were carried out in three stages:

Stage 1: Cultural adaptation–language validity: The items of the scale were translated into Turkish by two independent foreign language experts in accordance with the translation-back translation method. Afterward, the Turkish form created by the joint decision of the two experts was translated back into English by another language expert. The opinions of 10 experts (4 academicians, 4 veterinarians, 2 research assistant physicians) were obtained for the content validity of the Turkish form.[13,14] To determine the content validity of the items to be included in the scale, the Content Validity Index (CVI) was calculated. Evaluation of expert opinions was made with the Davis technique, which grades expert opinions as appropriate (4 points), the item should be slightly revised (3 points), the item should be reviewed seriously (2 points), and the item is inappropriate (1 point). The CVI for the item is obtained by dividing the number of experts who have ticked the option "appropriate" and "the item should be slightly revised" by the total number of experts. Accordingly, the CVI value of the BPQ was found 0.62. As a result of content validity, 14 items were excluded from the measurement tool.[15] BPQ consisted of direct awareness (15 items), indirect awareness (10 items), vaccine-oriented behavior (7 items), attitude (9 items), and practice (4 items) sub-dimensions and 45 items. A pilot study was conducted in a group of 10 people for the pre-testing of scale items. All participants stated that the test was clear, understandable, and unproblematic.

Stage 2: Construct (concept) validity: First, confirmatory factor analysis was performed on the data. Then, the concurrent criterion validity of the BPQ was tested by establishing a hypothesis. For this purpose, the

mean score of the scale was evaluated with the data obtained simultaneously with the HPS. In this context, the hypothesis "There is a positive correlation between the participants' BPQ scores and their HPS scores" was tested.

Stage 3: To test the invariance of the scale with respect to time, the correlation between test–retest scores was examined. To measure test–retest reliability, 50 participants underwent a second evaluation (retest) 15 days after the first one (test).[16]

SPSS v21 was used for data analysis. Number, percentage, mean, and standard deviation values were used in the evaluation of descriptive data. Mann–Whitney *U* analysis and Spearman's correlation were used to compare the means of the groups because the data did not show a normal distribution. Principal component analysis and varimax rotation were performed by applying factor analysis to test the construct (concept) validity of the scale. Kaiser–Meyer Olkin (KMO) coefficient and Barlett test result were calculated. Item total score correlation, internal consistency (Cronbach's alpha), and test–retest correlation (Wilcoxon signed rank test) were used to evaluate the reliability of the scale.

Results

The study was conducted with 276 male participants and the mean age was 44.42 (12.80) years (min: 18–max: 80). Although 39.2% of the study group were primary school graduates, 36.6% reported that their income was less than their expenses.

Although 15% of the participants reported that they had received training on brucella before, 3.6% reported that they had the disease. Although 67.8% of the farmers were breeding cattle, 42.1% reported that their animals had a miscarriage due to brucella.

Validity analysis results

Confirmatory factor analysis was used to examine the construct–concept validity of the scale. After the suitability of the data for factor analysis was checked, the KMO coefficient was found 0.914 and highly significant as a result of the Barlett test (χ^2 = 1710.1; $P < 0.001$). According to factor analysis, the variance explained in a five-dimensional structure was determined 61.8% and factor loads of 45 items in the scale were found to vary between 0.422 and 0.808.

Although the mean score of participants in the BPQ ranged from 89.39 (18.93) (min: 46–max: 179), the mean score from the HPS ranged between 46.58 (4.63) (min: 36–max: 70). The BPQ score distributions and the correlation values observed with HPS are presented in Table 1. A positive correlation was found between the mean BPQ score and the HPS scores (r = 0.170; P = 0.005). To test concurrent criterion validity, the predicted hypothesis was accepted [Table 1].

Reliability analysis results

It was found that the item-total correlations of 45 items on the scale ranged from 0.33 to 0.79. When any of the items were removed, Cronbach's alpha coefficient did not change significantly and was found to be between 0.94 and 0.95. Cronbach's alpha coefficient of the BPQ, which consisted of 5 factors and 45 items, was found to be 0.944, whereas Cronbach's alpha coefficients of its sub-dimensions ranged from 0.753 to 0.940 [Table 2].

Analysis of the invariance with respect to time showed no difference between the scale mean score of participants in the first interview (87.48 [17.81]) and the mean score in the re-interview (87.49 [17.82]) (Z = −1,134; P = 0.257).

Discussion

In order for a scale to be standardized and then have the ability to produce appropriate information, it is required to have two characteristics, namely "reliability" and "validity."[17] Due to the intercultural contextual differences, the scale adaptation process should consist of a series of stages that must be carried out meticulously. This necessity becomes important in the process of translating the scale into a different language. Should the adapted form of the scale is not culturally appropriate

Table 1: BPQ* score distributions and correlation values observed with HPS† score

BPQ subdomains	Mean (SD)	Median (min–max)	Correlation values with HPS† score and BPQ* score	
			r	*P*
Awareness				
Direct awareness (15 items)	31.28 (7.03)	32 (16-59)	0.103	0.090
Indirect awareness (10 items)	19.71 (4.81)	20 (10-41)	0.114	0.061
Vaccine oriented awareness (7 items)	12.67 (3.49)	14 (7-30)	0.181	0.003
Attitude (9 items)	16.56 (4.79)	18 (9-41)	0.299	0.000
Practice (4 items)	9.14 (2.37)	9 (4-20)	0.186	0.002
Total	89.38 (18.93)	94 (46-179)	0.170	0.005

*Brucella Prevention Questionnaire; †Health Perception Scale

Table 2: Factor loads and Cronbach's alpha coefficients of the brucella prevention questionnaire items

	Corrected item-total correlation	Cronbach's alpha if the item deleted	Factor 1 loading Direct awareness (AD*)	Factor 2 loading Indirect awareness (ID†)	Factor 3 loading Vaccine-oriented awareness (AV‡)	Factor 4 loading Attitude (A§)	Factor 5 loading Practice (P‖)
AD1	0.394	0.947	0.808				
AD2	0.621	0.946	0.769				
AD3	0.592	0.946	0.767				
AD4	0.384	0.947	0.764				
AD5	0.551	0.946	0.760				
AD6	0.612	0.946	0.754				
AD7	0.610	0.946	0.752				
AD8	0.336	0.947	0.751				
AD9	0.796	0.945	0.749				
AD10	0.569	0.946	0.746				
AD11	0.734	0.945	0.735				
AD12	0.707	0.945	0.728				
AD13	0.562	0.946	0.715				
AD14	0.694	0.945	0.711				
AD15	0.684	0.945	0.706				
ID1	0.702	0.945		0.681			
ID2	0.633	0.945		0.675			
ID3	0.330	0.947		0.671			
ID4	0.644	0.945		0.664			
ID5	0.703	0.945		0.652			
ID6	0.599	0.946		0.652			
ID7	0.481	0.946		0.650			
ID8	0.647	0.945		0.648			
ID9	0.662	0.945		0.646			
ID10	0.686	0.945		0.639			
AV1	0.666	0.945			0.621		
AV2	0.682	0.945			0.621		
AV3	0.662	0.945			0.617		
AV4	0.678	0.945			0.617		
AV5	0.577	0.946			0.593		
AV6	0.555	0.946			0.587		
AV7	0.550	0.946			0.573		
A1	0.713	0.945				0.562	
A2	0.622	0.946				0.530	
A3	0.576	0.946				0.422	
A4	0.599	0.946				0.496	
A5	0.602	0.946				0.699	
A6	0.542	0.946				0.627	
A7	0.657	0.945				0.543	
A8	0.672	0.945				0.550	
A9	0.542	0.946				0.513	
P1	0.339	0.947					0.606
P2	0.368	0.953					0.610
P3	0.398	0.947					0.785
P4	0.564	0.946					0.591
Cronbach's alpha coefficients			0.942	0.882	0.787	0.902	0.753

*Direct awareness; †Indirect awareness; ‡Vaccine-oriented awareness; §Attitude; ‖Practice

and understandable, its validity and reliability would be affected. The use of such measurement tools could bring about negative results. The purpose of the validity test is to form a whole consisting of meaningful items by examining whether the items in the measurement tool represent the area to be measured or not.[18]

The aim of our study was to evaluate the validity and reliability of the adaptation of the BPQ, developed by Bahadori *et al.*, to Turkish society and culture.[9] In the preparation of the Turkish form of the scale, its compatibility with language and culture was sought by experts in the field and language. The language validity of the scale was found to be appropriate. The Turkish form created was submitted to experts for content validity. In line with the opinion of experts, 14 of the 59 items in the original scale were excluded from this study. As a result of the evaluation of the scores given by the experts to these items, it was concluded that the content of the scale was suitable for use in the field of Brucella prevention and was valid in scope.[15] The factor analysis results used to determine the construct validity of the scale were found to be appropriate. The total explained variance value in factor analysis reveals how much of the variable to be measured is explained by factor analysis and propositions. It is quite acceptable that this structure explains 61.8% of the total variance.[17,19] Along with the validity of the scale, the scale dimensions were confirmed by confirmatory factor analysis. The BPQ showed a five-dimensional structure as in its original shape. In contrast, it has been reported that the process of determining the construct validity of a scale is the same as the scientific theory development process, and construct validity can be tested by generating defined and testable hypotheses and statistical evaluation of these hypotheses.[17] Our hypothesis to determine the concurrent criterion validity and construct validity of the BPQ was confirmed. Accordingly, BPQ scores-awareness increased as people's perception of health increased. In line with these results, we can say that BPQ is suitable for our culture and represents the area to be measured.

Reliability is defined as how accurately the measurement tool measures the feature it wants to measure and its power to give consistent measurement results.[17] Reliability is evaluated by item-total score correlation, internal consistency (Cronbach's alpha), and test–retest correlation. The internal consistency of the BPQ was tested by calculating Cronbach's alpha coefficient. It is assumed that the higher the internal consistency coefficient, the more consistent the items in the scale are. Cronhbach's alpha value of >0.60 was required.[18,20,21] In our study, the BPQ Cronbach's alpha value was found to be 0.944. The BPQ sub-dimensions were also examined and Cronbach's alpha values were found to be between 0.753 and 0.940. Cronbach's alpha values vary in different societies and cultures where the scale was applied. In the original study, Cronbach's alpha for awareness, attitude, and practice was 0.865, 0.833, and 0.825, respectively.[9] The high internal consistency coefficient of the scale indicates that the internal consistency was sufficient. The reliability level of all sub-dimensions of the scale was sufficient. The score invariance of the scale was examined using the test–retest method.[22] In our study, no difference was found between test–retest scores.

In addition, it is reported that the item-total score correlation is also important to show the relationship between the scores obtained from the test items and the total score of the test, and this correlation was positive and higher than 0.30, indicating that the items exemplify similar behaviors, and the internal consistency of the test is high. Item-total correlation is the correlation coefficient of each item in the scale with the sum-total of items other than that item. In the item-total score correlation analysis of the scale, correlation coefficients were found to vary between 0.33 and 0.79. Considering that items with a score of 0.30 and higher in the interpretation of item-total correlations distinguish individuals well in terms of the measured feature, item-total correlations seem to be sufficient.[13,18,23] The BPQ is a highly reliable scale. When the scale is examined as a whole, it has been determined that it has a high level of reliability and can be used safely to create scientific evaluations about the field of study with high validity and reliability.[18]

Conclusion

Validity analyses show that the BPQ is appropriate for our culture and represents the area to be measured. Internal consistency values show that the reliability in terms of internal consistency is high. The test–retest reliability coefficients are high and sufficient. The item-total correlation results prove that the item discrimination power of the scale is sufficient. Findings from validity and reliability studies show that the Turkish version of the BPQ is a valid and reliable scale in Turkish society and culture. The Turkish version of the BPQ can be used to evaluate the effective factors on the brucellosis preventive behaviors of breeders.

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Conflicts of interest

There are no conflicts of interest.

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