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ORIGINAL ARTICLE

Validity and Reliability of Bariatric Surgery Self-Management Behaviors Questionnaire in Iranian Population

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ABSTRACT

Background: Bariatric surgery is the most effective intervention for treatment of severe obesity and patient's adherence to self-management behaviors are essential to reduce complications after surgery. The purpose of this study was to investigate the validity and reliability of bariatric surgery self-management behaviors questionnaire (BSSQ) in Iranian population.

Methods: From December 2016 till June 2016, all obese patients who underwent laparoscopic obesity surgery in Shiraz Ghadir Mother and Child Hospitalwere were enrolled. Their demographic characteristics, BSSQ, General Adherence Scale (GAS), and the Specific Adherence Scale (SAS) questionnaires were collected. The content, structural and simultaneous validity and factor analysis were determined using GAS and SAS questionnaires.

Results: According to psychometric factors including eating behaviors, fluid intake, vitamin and mineral supplement intake, fruits, vegetables, whole grain and protein intake, physical activity and dumping syndrome management, 6 factors could explain 61.5% of BSSQ. Total score of correlation matrix BSSQ with GAS and SAS were 0.36 and 0.70. For reliability, the Cronbach's alpha coefficient was found 0.90 and Guttmann split-half coefficient was 0.78.

Conclusion: BSSQ was shown to have an acceptable validity and reliability to be used for assessing the bariatric surgery self-management behaviors in Iranian population.

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Introduction

Obesity is one of the most important fields of study in health psychology, which is directly and indirectly associated with many diseases and is considered as a chronic and very common disorder, so that in 1984 obesity was included in the

International Classification of Diseases (1, 2). The evidences suggest that obesity, especially morbid obesity, has a major negative impact on physical, psychological and social health, with serious and dangerous problems and illnesses such as early death, increased risk of diabetes, hypertension, cardiovascular disease, menstruation irregularities, infertility, types of cancer, migraine, gallstones and respiratory diseases such as obstructive sleep apnea during sleep (3-7).

To address this pervasive phenomenon, multiple coping and therapeutic methods, including reduced calorie intake, increased physical activity, changes in dietary habits, diet, weight loss medications and surgical treatments were presented that each of these has different efficacy. Surgerical treatment for obesity is limited to people with morbid or severe obesity along with the complications of obesity (8). Nowadays, with the advancement of surgical procedures, treating obesity with surgery can reduce long-term weight, eliminate or improve related illness associated with morbid obesity and improve the quality of life, and also obesity reduces the risk of death by up to 35% over time (9).

Various types of laparoscopic surgical procedures for obesity have been introduced including laparoscopic adjustable gastric banding (LAGB), gastric bypass (roux-en-Y gastric bypass -RYGB), and laparoscopic sleeve gastrectomy (laprascopic sleeve gastrectomy-LSG) (10, 11). Although surgerical treatment for obesity is the most effective method of intervention for severe obesity, few people (about 30%) have reached the desired weight and to be maintained (12). Therefore, surgery for the treatment of obesity will be effective, when people manage non-hygienic and unhealthy habits such as overeating, emotionally eating, night eating, drinking high-calorie fluids or returning to the previous lifestyle (13, 14).

Self-management is a topic that plays an important role in building individuals' power to manage their behavior and performance in the individual and organizational context and in promoting productivity, and it addresses the control of lifestyle changes, as well as a method of health care, in which the patient plays a pivotal role in promoting the health level, disease prevention, and successful disease control (15). Self-management is influenced by a variety of factors such as well-being, quality of life, and physical-psychosocial status of the patient, resulting in improvement or inability of the patients, and affects the outcome of the treatment, and in chronic diseases, it is considered as an important component of care which is considered to be effective in persuading patients to change their behavior or lifestyle (16, 17). Therefore, adaptation to healthy lifestyles is essential in reducing postoperative complications, and in order to have a healthy life, these individuals should use health promoting behaviors in their daily activities to change their lifestyles, and adhere to the recommendations of the postoperative surgery (18, 19).

Self-management behaviors after bariatric surgery include eating behaviors, fluid intake, physical activity, dumping syndrome management, fruit, vegetable, and whole grains intake, the vitamin and mineral supplement intake, and protein intake for weight loss (11, 12, 20, 21). Health psychologists recommend that one of the effective strategies to increase the effectiveness of treatment of obesity is to examine the factors influencing self-management behaviors and adherence to the dietary habits (22). Therefore, the design, implementation and evaluation of a comprehensive framework for increasing the self-management behaviors of people undergoing obesity surgery is necessary to reduce postoperative complications and to increase its positive outcomes (23). So far, in Iran no tool has been designed to measure the bariatric surgery self-management behaviors. Therefore, the present study was conducted to evaluate validity and reliability of bariatric surgery self-management behaviors after bariatric surgery in Iranian population.

Materials and Methods

The method of the present study was descriptive and a type of test making method. The statistical population included all the obese patients who underwent laparoscopic sleeve gastrectomy from the beginning of December 2016 to the end of June 2016 at Shiraz Ghadir Mother and Child Hospital, while 201 patients, with at least one month and the maximum three months, of their surgery were enrolled using the available sampling method. These patients had a BMI greater than 35 (mean: 36.43 and SD of 11.35) and were in the age range of 18-65 years (mean: 38.13 and SD of 80.5). 149 of these patients were women (66%) and 52 were men (24%), 69 were single (30.1%) and 132 were married (58.4%). People with learning disabilities, under psychiatric treatment, or serious medical problems, such as other chronic diseases other than obesity, were excluded from the study.

After explaining the importance and purpose of the study to the participants and emphasizing the confidentiality and anonymity of the information, the informed consent form for participating in the research were obtained from all the participants. Then, all the participants completed the demographic characteristics questionnaire, the Bariatric Surgery Self-management behaviors Questionnaire (BSSQ),

the General Adherence Scale (GAS), and the Specific Adherence Scale (SAS) questionnaires.

Required explanations were provided to patients to answer the questions. The questionnaires were also checked after filling to ensure that patients responded to all questions. In order to determine the validity of the questionnaire, content, structural and simultaneous validity, factor and correlation analysis were recorded. For reliability of the questionnaire, split-half methods, and internal consistency by applying Cronbach's alpha were applied. The instruments used in this research were personal information questionnaire (age, gender, economic, social, marital, physical and mental health status and surgical history), BSSQ, GAS, and SAS.

BSSQ was designed by Welch et al. (20) to measure the patient's follow-up of post-operative obesity orders. It has 33 questions about recommended behaviors for obesity surgery. The items in this questionnaire have emphasized on health behaviors suggested by experienced clinicians for weight loss, and measures the follow-up of patients in 7 subscales including eating behaviors (8 questions), fluid intake (8 questions), physical activity (3 questions), dumping syndrome management (4 questions), vitamin and mineral supplement intake (4 questions), fruit, vegetable, and whole grains intake (3 items), and protein intake (3 questions). To score BSSQ, 1-0 scoring was used (always, sometimes, never).

The subscales for each domain were calculated with a total score (in the range of 0-99), and the higher scores showed more compliance. The reliability of this scale was 0.83 for Cronbach's alpha and 0.83, 0.71, 0.74, 0.70, 0.79, 0.63 and 0.79 for subscales, respectively. The test-retest reliability, with a two-week interval, for the whole questionnaire was 0.71 and for the subscales was 0.72, 0.68, 0.66, 0.54, 0.66, 0.46 and 0.66, respectively. Structural validity was also calculated by internal correlation ($p<0.05$, $r=0.15$ to $P<0.01$ and $r=0.39$) (20).

The GAS, and SAS were designed to measure the follow-up rates in chronic patients by Heyz et al. (24). The GAS measured the patient's overall willingness to follow the physician's recommendations. This scale had five articles, and its internal consistency was acceptable ($\alpha=0.81$). The SAS measured the extent of compliance with the specific recommendations for a particular disease. The SAS for cardiac patients assessed the extent the cardiac patients follow-up the recommendations for drug use and lifestyle changes. This scale had 10 articles in the 6-degree Likert scale and its obtained internal consistency was acceptable ($\alpha=0.73$).

The reliability of these two scales was obtained in the study of Heiz et al. (24) based on the correlation between the test scores, with a two year interval, was acceptable (SAS=0.55 and GAS=0.60). In the present study, the SAS of patients with obesity have been modulated based on the specificity of the cardiovascular follow-up scales, which tracked the follow-up of obesity patients to dietary recommendations, supplements and lifestyle changes. The obtained alpha coefficient for the GAS and for the SAS were 0.76 and 0.87, respectively.

Results

To determine the validity ofthe bariatric surgery self-management behaviors questionnaire, three methods of content, construct and concurrent validity were used. Regarding the content validity, at first, the Latin version of the bariatric surgery self-management behaviors questionnaire was translated into Persian by researcher and a nutritionist familiar with self-management behaviors after bariatric surgery who was fluent in English. The Persian version of the questionnaire was then back-translated into English by a translator of English.

Then, the Latin version of the questionnaire and the back-translated version were compared. In order to investigate the content validity of the questionnaire, 11 faculty members, 4 gastroenterologists, 3 dietitians, 1 physicians and sports medicine specialist, 1 physiotherapy specialist, 1 psychiatric specialist and 1 health psychology specialist were asked to identify the vague sentences and write their suggestions. Based on their suggestions necessary changes were made. The content validity was then evaluated qualitatively and then the final version of the questionnaire was prepared.

For structural validity in this research to investigate the structural validity, the exploratory factor analysis and correlation analysis were used. For exploratory factor analysis, before performing

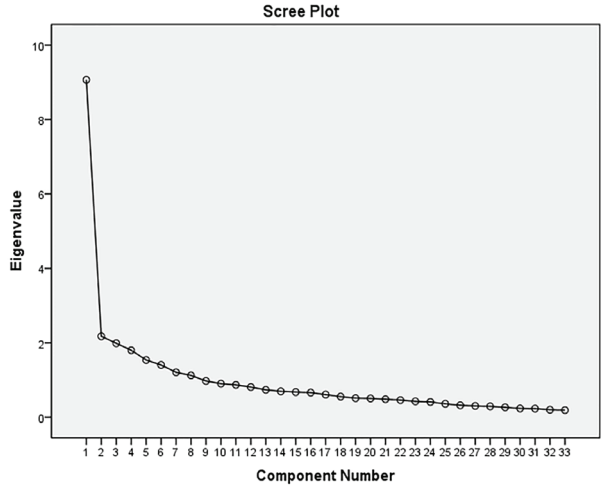

Figure 1: Gradient scree plot diagram of BSSQ

the exploratory factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett tests were performed to check the suitability of the collected data. The obtained coefficient of KMO of the correlation matrix of items was equal to 0.87, which indicates that the sample's adequacy of the factor analysis is satisfactory. Also, the value of Bartlett's coefficient was equal to 2591.37 which was significant at $p<0.0001$, indicating that factor analysis is suitable for identifying the functional structure.

After obtaining an assurance from the two above indices by using factor analysis of the main components, the items of the questionnaire were analyzed. The best combination of content according to the skew diagram (Figure 1), the special value and the percentage of variances were a 6-factor matrix. After the rotation of the questionnaire's matrix, in the varimax method, the content of each factor was determined based on the factor loadings of each item. After reviewing the terms of each agent, and according to the content of the items, re-naming of the agents were made.

As shown in Table 1, the special values were identified in each of the 6 factors, which together explained 61.54% of the variance of BSSQ. So that, the first factor (eating behaviors) with 10 items, and 25.48% variance had the highest participation, the second factor (fluid intake) with 6 items, and

Table 1: The results of factor analysis of BSSQ

Main Factors	Factor 1: Eating behaviors	Factor 2: Fluid intake	Factor 3: Vitamin and mineral supplement intake	Factor 4: Fruits, vegitables, whole grain and protein intake	Factor 5: Physical activity	Factor 6: Dumping syndrome management
Special amount	6.32	3.92	3.02	2.66	2.05	1.94
Variance percentage	25.48	15.12	6.59	5.45	4.66	4.24
Items	Factor load					
Item 1	0.79					
Items 2	0.77					
Item 3	0.68					
Item 4	0.72					
Item 5	0.54					
Item 6	0.58					
Item 7	0.60					
Item 8	0.53					
Item 20	0.54					
Item 33	0.57					
Item 9		0.64				
Item 10		0.61				
Item 11		0.62				
Item 13		0.69				
Item 14		0.75				
Item 16		0.61				
Item 17			0.78			
Item 25			0.77			
Item 26			0.70			
Item 27			0.77			
Item 28				0.68		
Item 29				0.71		
Item 31				0.75		
Item 32				0.52		
Item 17					0.64	
Item 18					0.65	
Item 19					0.76	
Item 21						0.62
Item 22						0.65
Item 23						0.67
Total percentage of variance	61.54					

15.22% variance, the third factor (vitamin and mineral supplement intake) with 4 items and 6.59% variance, the fourth factor (fruits, vegitables, whole grain and protein intake) with 4 items, and 5.45% variance, the fifth factor (physical activity) with 3 and the variances of 4.66, and finally the sixth factor (dumping syndrome management) having 3 items, and variance of 4.24%, explained the variance of self-management behaviors after the bariatric surgery. After factor analysis, 3 items which had a low variance based on the scree plot diagram were excluded from the questionnaire.

One of the methods for determining the structural validity of each test is the existence of a satisfactory correlation between its factors. The results of the correlation matrix (Table 2) indicated that there was a positive and significant relationship between the various factors of the self-management behavior questionnaire after the Bariatric surgery, as well as between the factors and the total score.

In order to evaluate the simultaneous validity of the questionnaire, the simultaneous implementation of BSSQ, GAS and SAS were used. In order to determine its concurrent validity, Pearson Correlation Coefficient was used. The results of were illustrated in Table 3.

From Table 3, it can be concluded that only the third factor had no relationship with the GAS (P<0.01 and r=0.90). The first factor (P<0.01 and r=369), the second factor (P<0.01 and r=0.244), the fourth factor (P<0.01 and r=258), the fifth factor (P<0.05 and r=0.175), the sixth factor (P<0.01 and r=289), and the total score of BSSQ (P<0.01 and r=0.363) had a direct and significant relationship with the GAS. The results also showed that the first factor (P<0.01 and r=0.666), the second factor (P<0.01 and r=317), the third factor (P<0.01 and r=0.378) the fourth factor (P<0.01 and r=231), the fifth factor (P<0.01 and r=578), the sixth factor (P<0.01 and r=550), and total score of BSSQ (P<0.01 and r=0.702) had a direct and significant relationship with the SAS.

To assess the reliability of BSSQ, split methods and Cronbach's alpha internal consistency were used. The Cronbach's alpha reliability coefficient

Table 2: The matrix results of correlation between factors with total score of BSSQ

Dimensions	Eating behaviors	Fluid intake	Vitamin and mineral supplement intake	Fruits, vegitables, whole grain and protein intake	Physical activity	Dumping syndrome management	Total
Eating behaviors	1						
Fluid intake	0.55**	1					
Vitamin and mineral supplement intake	0.53**	0.26**	1				
Fruits, vegitables, whole grain and protein intake	0.192**	0.20**	0.187**	1			
Physical activity	0.56**	0.41**	0.45**	0.280**	1		
Dumping syndrome management	0.52**	0.45**	0.33**	0.121**	0.29**	1	
Total	0.93**	0.68**	0.62**	0.46**	0.74**	0.64**	1

*Significant at the level of 0.05, **Significant at the level of 0.01.

Table 3: The Correlation matrix of total score and factors of BSSQ with GAS and SAS

Variable	Eating behaviors	Fluid intake	Vitamin and mineral supplement intake	Fruits, vegitables, whole grain and protein intake	Physical activity	Dumping syndrome management	Total score
General Adherence Scale	0.369**	0.244**	0.090*	0.258**	0.175*	0.289**	0.363**
Specific Adherence Scale	0.661**	0.317**	0.378**	0.231**	0.578**	0.550**	0.702**

*Significant at the level of 0.05, **Significant at the level of 0.01.

Table 4: The Cronbach's Alpha Coefficient and Gutmann Coefficient for BSSQ.

Variable	Total Number of items	Item number	Number of samples	Average	Standard Deviation	Gutmann coefficient	Cronbach's alpha
Eating behaviors	10	1،2،3،4،5،6،7،8،20،33	201	100.73	6.18	0.88	0.89
Fluid intake	6	9،10،11،13،14،16	201	60.11	4.42	0.83	0.85
Vitamin and mineral supplement intake	4	24،25،26،27	201	40.08	2.08	0.66	0.77
Fruits, vegitables, whole grain and protein intake	4	28،29،31،32	201	40.78	1.70	0.55	0.68
Physical activity	3	17،18،19	201	30.13	1.66	0.63	0.65
Dumping syndrome management	3	21،22،23	201	30.53	1.64	0.53	0.63
Total	30		201	320.36	11.55	0.78	0.90

BSSQ: Bariatric Surgery Self-Management Behaviors Questionnaire

for the whole questionnaire was 0.90. By using the split-half method, the correlation of the two parts was equivalent to 0.78, which indicated the desired reliability of the entire questionnaire. Also, to assess the reliability of the factors, internal consistency and Cronbach's alpha internal consistency methods have been used. The reliability of the total score and dimensions of BSSQ are presented in Table 4.

Based on Table 4, the first factor alpha coefficient was 0.89 and the split-half coefficient was 0.88, the second factor alpha coefficient and the split-half coefficient were 0.83 and 0.85, respectively. The third factor alpha coefficient was 0.66 and the split-half coefficient was 0.77. The coefficient of alpha for the fourth factor was 0.55 and the split-half coefficient was 0.68. The fifth factor alpha coefficient was 0.63 and the split-half coefficient was 0.65 and the sixth factor alpha coefficient was 0.53 and the split-half coefficient was 0.63.

Discussion

The purpose of this study was to evaluate the validity and reliability of bariatric surgery self-management behaviors questionnaire in Iranian population. Altogether, the results showed that for assessing self-management behavior after bariartic surgery, the persian scale of Welch et al. (20) can be used reliably. Regarding the validity of the questionnaire, according to many researches (25, 26), content, structural (factor analysis and correlation analysis) and simultaneous validity were used.

The findings from exploratory factor analysis showed that six factors of eating behaviors, vitamin and mineral supplement intake, fruits, vegitables, whole grain and protein intake vegetables, cereals and protein, physical activity, and dumping syndrome management for BSSQ was extracted, and these factors explained 61.54% of the variance of BSSQ, and the explanatory variance of each factor was 25.48, 15.12, 59.6, 45.5, 4.6 and 4.24 percent, respectively. The original version of the questionnaire includes 33 items and seven factors that assess the bariatric surgery self-management behaviors questionnaire, such as eating habits, fluid intake, physical activity, dumping syndrome management, fruit, vegetable, and whole grains intake, vitamin and mineral supplement intake (20).

According to the findings of this research, items 12, 15 and 30 were excluded from BSSQ due to their low factor load. In explaining this finding, it seems that due to the cultural differences, these three terms were less comprehensible to the participants, although with due diligence, changes were made to them in the translation process. Also, items 20 and 33 of the dimensions in the original version were moved to the eating behaviors. The inclusion of these criteria in the eating behaviors and moving them from dumping syndrome management and protein intake, according to the definition of eating behaviors based on the study of food labels in order to identify the amount of sugar and protein in it was justifiable.

In this study, the factors of fruit, vegetable, and whole grains intake and protein intake had a very high overlap, therefore they were placed in one factor. Culturally, nutritional information and referring to a nutritionist among the Iranian population is not common, and probably they are not familiar with the food pyramid to distinguish between fruits, vegetables, grains and protein substances. Therefore, the lack of nutritional information has led participants to respond to these categories, putting these food groups in a class. Maybe, this explanation could justify this finding. Except for the mentioned items, other factors found in the current

research and research done by Welch et al. (20) were consistent with each other and are their item scales were common. Psychometric experts considered the correlation between the factors of a test with each other due to the internal consistency and construct validity of a test (27).

The results of the correlation matrix of this study showed that there was a positive and significant relationship between the various factors of BSSQ as well as between the factors and the total score, as compared with the results of Welch et al. (20), Andrews et al. (28) and McMahon et al. (29). In this study, in order to evaluate the simultaneous validity, the concurrent implementation of BSSQ and GAS were used. The findings showed that, except for the vitamin and mineral supplement intake factor, other factors of the BSSQ had a direct and significant relationship with the GAS and SAS. Also, based on the results of this study, all factors of BSSQ had a direct and meaningful relationship with the follow-up scales after obesity surgery (11, 20, 30).

In order to evaluate the reliability of the BSSQ, split-half method and Cronbach's alpha internal consistency were used. The reliability coefficient for the whole questionnaire by calculating the Cronbach's alpha was 0.90 and by using the split-half method, the two-part correlation was equivalent to 0.78, which indicated that the questionnaire was a reliable one. Also, to investigate the reliability of the factors, split half methods and Cronbach's alpha internal consistency were used. These findings were consistent with the results of Welch et al. (20).

The results of the Courcoulas and Flum (31) study, showed that one of the key issues in dealing with the results of bariatric surgery was identifying the causes of non-compliance of patients with postoperative orders. Therefore, the design of screening tools is necessary to identify the predictive factors of non-compliance of people undergoing bariatric surgery in order to reduce postoperative complications (20). Considering that in Iran, the applicants for surgery to prevent complications of obesity is increasing and the mass media and peoples are volunteers of fitness and keep their weight to the optimum level, so follow the instructions of the physician and self-management behaviors play an essential role in achieving optimal weight loss after bariatric surgery.

Conclusion

Finally, it can be concluded that bariatric surgery self-management behaviors questionnaire has a high validity and reliability in the Iranian population and as regards, its item scale are in accordance with Iranian culture, it can be used as a valid tool to measure the amount of self-management behaviors after bariatric surgery in Iran. One of the limitations of this study is its limitation to the patients referred to Shiraz Ghadir Mother and Child Hospital, which is likely to cause trouble to generalize the results of the current study to other populations. Therefore, it is suggested that in future research, self-management behaviors in wider populations be investigated and also the variable of time passed from the surgery and its impact on self-management behaviors be considered.

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Conflict of Interest

None declared.

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