

Turkish Adaptation of Diabetic Foot Ulcer Scale–Short Form

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Abstract

The purpose of this study was to evaluate the validity and reliability of the Turkish version of the Diabetic Foot Scale–Short Form (DFS-SF). The study was cross-sectional and conducted between January and October 2019 in a diabetic foot council of a university hospital. A total of 194 diabetic foot patients participated in the study. A Patient Identification Form and DFS-SF were used for data collection. Forward and backward translations were used in language validity. Expert opinions were obtained to determine the Content Validity Index. To determine construct validity, exploratory factor analysis and confirmatory factor analysis were used. Cronbach's α internal consistency coefficient, item-scale correlation, and test-retest reliability were used to evaluate reliability. It was found that Content Validity Index was 0.97 (0.86–1.00), the factor loading of scale varied from 0.378 to 0.982, Cronbach's α value varied from 0.81 to 0.94, and item-total correlations were between 0.30 and 0.75. The Turkish version of the DFS-SF was found valid and reliable to measure the quality of life of diabetic foot patients.

Keywords

diabetic foot, quality of life, validity, reliability, Turkish

Introduction

Diabetic foot is a common and severe complication that affects many diabetic patients.¹ Many factors such as nerve damage and vascular insufficiency cause the diabetic foot. Diabetic foot is the leading cause of nontraumatic lower limb amputation in the community. It is also responsible for 85% of the amputations in diabetic patients.^{2,3}

With the increasing prevalence of diabetes in the world, the amount of people affected by diabetic foot has also increased.⁴ The prevalence of diabetic foot varies by region and country. In regions, the highest prevalence is reported in North America with 13%, and the lowest is reported in Oceania with 3%. In countries, the highest prevalence is reported in Belgium with 16.6%, and the lowest is reported in Australia with 1.5%.⁵ In developing countries, diabetic foot thought to be more common.

Diabetic foot is negatively affecting patients' self-esteem, role performance, mobility, psychology, socioeconomic status, and therefore the quality of life (QoL).^{6–9} The QoL is limited in diabetes, and it is much more limited in patients with a diabetic foot. It was reported in the literature that diabetic foot has a negative impact on the psychological, physical, social, and economic aspects of QoL.¹⁰

Improving the QoL of diabetic foot patients is one of the main objectives of care. To improve QoL, the measurement

of QoL is essential.¹¹ However, there are limited QoL measurement tools for diabetic foot patients in the world and no measurement tool in Turkey. The aim of this study was to determine the validity and reliability of the Diabetic Foot Ulcer Scale–Short Form (DFS-SF) to Turkish society and adapt to Turkish.

Materials and Methods

This study was conducted with the aim of determining the reliability and validity of DFS-SF in Turkish society.

Study Design

The study was cross-sectional and conducted between January and October 2019 in a diabetic foot council of a university hospital. The convenience sample was used for the study. Among the patients who met the inclusion criteria,

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Table 1. Steps of Linguistic Validation.¹²

Stages	Questionnaire
Forward translation by 5 independent translators	Forward translation A1 (Turkish), A2 (Turkish), A3 (Turkish), A4 (Turkish), and A5 (Turkish)
Merging session (analysis and reconciliation) with the presence of translators and the executive manager	Forward translation B
Backward translation by another independent translator	Backward translation (English)
Comparing the main questionnaire with the backward translation by the MAPI Research Institute	Forward translation (Turkish) C
Review by different experts interested in diabetic foot	Forward translation (Turkish) D
Final checking and amendment	Forward translation (Turkish) E

194 patients participated in the study. The inclusion criteria for the patients included the presence of diabetic foot, able to communicate in Turkish, the absence of psychiatric problems, and acceptance to participate in the study.

Data Collection

A Patient Identification Form and DFS-SF were used for data collection of the study. Data were collected from the patients with a face-to-face interview before the council. This process took about 10 to 15 minutes per patient.

Patient Identification Form. This form was developed by the research team with regard to literature and including sociodemographic characteristics such as gender, age, marital status, and disease-related characteristics such as treatment type, Wagner classification, and disease duration.

Diabetic Foot Ulcer Scale–Short Form. DFS-SF was developed by Bann et al.¹⁰ It is a short version of the 64-items Diabetic Foot Ulcer Scale developed in 2002. DFS-SF is a 5-point Likert-type scale ranging from 1 “not at all” or “none of the time” to 5 “a great deal” or “all of the time” or “extremely” and consists of 29 items grouped into 6 subscales. These subscales are leisure (5 items), physical health (5 items), dependence/daily life (5 items), negative emotions (6 items), worried about ulcers/feet (4 items), and bothered by ulcer care (4 items). The scores of scale and subscales are ranging from 0 to 100. Higher scores show better QoL. Cronbach’s α coefficient value of scale and subscales is reported between 0.80 and 0.95.¹⁰

Validity of DFS-SF

Language Validity. The language validation of the study was done according to MAPI Research Institute guidelines¹² (Table 1).

Content Validity. To determine content validity of Turkish version of DFS-SF, reviews of 9 experts who are interested

in the field of diabetic foot were considered. Three of them were working in a nursing faculty. Four of them were working as clinician in endocrinology and metabolic disorders department, one of them was working as a diabetic foot nurse in the same department, another one was a surgeon in orthopedics department, and the last one was a clinician in the infectious disease department in a university hospital. According to the review of the experts, the Content Validity Index (CVI) was calculated. Item-scale correlations were also considered for initial assessment and purification.

Construct Validity. Confirmatory factor analysis (CFA) and exploratory factor analysis were used to determine factor loadings. But before the factor analysis, to determine suitability of the data for factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett’s test were used. KMO value is ranged from 0 to 1. The values under 0.50 means that the data are suitable for factory analysis.¹³ To preserve original factor structure of the scale, factor loadings were evaluated for 6-factor structure. We used the varimax rotation method that minimizes the number of variables that have high loadings on each factor. This method simplifies the interpretation of the factors. CFA was used to evaluate the relationship between the items, subscales, and scale.

Reliability

For the Likert-type scales, Cronbach’s α coefficient is the method most commonly used to examine internal consistency. Cronbach’s α was calculated in each subscale of the DFS-SF to assess the internal consistency reliability. A Cronbach α coefficient $\geq .70$ is considered as excellent. The item-scale correlations were used to determine the relationships between the scores of each item and scale scores. The correlations >0.30 is considered as acceptable. Test-retest reliability refers to the stability of the scale.^{14,15} Repeated measures were made in the same patients with an interval of 3 weeks. For retest analysis, the form was reapplied to the 30 patients.

Statistical Analyses

In the case of missing value, the patients were excluded from the analysis due to the probability of change in results. Seventeen of 211 patients were excluded from the analysis and the analysis completed with 194 patients. IBM SPSS 25.0 package program was used for Cronbach's α reliability coefficient, factor analysis, Bartlett's test, KMO test, and correlation. AMOS v25 was used for confirmatory factor analysis.

Ethical Approval

Written permissions were obtained from the medical research ethics committee of relevant university (Protocol: 19-4T/39) and hospital. Informed consent was obtained from all individual participants included in the study. All procedures were performed in studies in accordance with the Helsinki Declaration and its later amendments or comparable ethical standards.

Results

Of the participants, 65.5% were male and 85.6% were married. The mean age of the participants was 62 ± 10 years. Other sociodemographic characteristics of the participants are presented in Table 2.

Of the participants, 80.6% were using insulin and the mean duration of diabetes was 15.58 ± 12.97 years. The Wagner class was 3 and below for 81.3% of the patients. Other disease-related characteristics are presented in Table 3.

Validity

After the translation of the scale, expert opinions were obtained to determine CVI. The CVI of the scale was 0.97 (0.86-1.00). KMO and Bartlett sphericity tests were performed to determine suitability of data for factor analysis, and the KMO value (0.739) and Bartlett sphericity test (χ^2 : 6169.794, standard deviation: 406, $P < .001$) showed that the data are suitable for factor analysis. It was determined that the scale under the 6-factor structure explained 77.09% of the total variance. Factor loadings of items in CFA ranged from 0.38 to 0.98 (Table 4). So, the 29-item and 6-factor structure of the scale was preserved.

Reliability

Cronbach's α was used to determine internal consistency. Cronbach's α value was found to be 0.94 for the Turkish version of DFS-SF. Cronbach's α values in subscales were found to be 0.91 for lesion, 0.87 for physical health, 0.83 for negative emotions, 0.88 for dependency/daily life, 0.94 for worried about ulcers/feet, and 0.81 for bothered by ulcer care.

Table 2. Distribution of Sociodemographic Characteristics of Participants.

Characteristics	n	%
Gender		
Male	127	65.5
Female	67	34.5
Marital status		
Married	166	85.6
Single	28	14.4
Education level		
Primary school	158	81.4
High school	26	13.4
University	10	5.2
Income level		
Income less than the expense	80	41.2
Income equal to the expense	106	54.6
Income higher than the expense	8	4.1
Living in		
City	45	23.2
Town	129	66.5
Village	20	10.3
Smoking		
Yes	98	50.5
No	96	49.5
Alcohol consumption		
Yes	36	18.6
No	158	81.4
		Mean \pm SD
Age		62 \pm 10

Table 3. Distribution of Disease-Related Characteristics of Participants.

Characteristics	n	%
Therapy		
Oral antidiabetic	36	18.6
Insulin	158	81.4
A regular visit to a medical doctor?		
Yes	146	75.3
No	48	24.7
Have applied to the hospital in the last 6 months		
Yes	184	94.8
No	10	5.2
Hospitalization in last year		
Yes	130	67.0
No	64	33
Wagner classification ¹⁶		
Wagner 1	22	11.3
Wagner 2	56	28.9
Wagner 3	80	41.2
Wagner 4	26	13.4
Wagner 5	10	5.2
		Mean \pm SD
Duration of diabetes (years)		15.58 \pm 12.97

Table 4. Factor Loadings and Item-Scale Correlation of DFS-SF^a.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Item-Scale Correlation	Cronbach's α if Item Deleted
1	0.73	0.57	-0.13	-0.28	0.14	-0.11	0.54	.94
2	0.74	0.53	-0.34	-0.01	0.15	-0.05	0.56	.94
3	0.85	0.37	-0.10	0.02	-0.53	0.23	0.56	.94
4	0.89	0.46	-0.01	0.03	-0.48	0.20	0.58	.94
5	0.85	0.36	0.03	0.00	0.39	-0.02	0.70	.93
6	0.70	0.72	0.18	0.02	0.39	0.00	0.65	.94
7	0.66	0.89	0.49	0.02	0.04	0.18	0.62	.94
8	0.46	0.70	0.54	-0.10	0.07	0.11	0.42	.94
9	0.56	0.79	0.49	-0.11	-0.15	0.12	0.51	.94
10	0.53	0.73	0.51	0.17	-0.17	-0.18	0.48	.94
11	0.14	0.41	0.66	0.57	0.33	0.29	0.30	.94
12	0.31	0.48	0.84	0.53	0.31	0.00	0.31	.94
13	0.54	0.45	0.88	0.43	0.02	-0.18	0.53	.94
14	0.60	0.40	-0.07	0.33	0.85	-0.20	0.59	.94
15	0.61	0.41	-0.04	-0.05	0.98	-0.18	0.59	.94
16	0.57	0.12	0.06	0.46	0.93	-0.12	0.52	.94
17	0.64	0.24	0.73	-0.35	0.02	0.51	0.61	.94
18	0.67	0.23	0.06	-0.38	0.82	0.32	0.65	.94
19	0.37	0.32	0.54	0.25	0.00	-0.07	0.62	.94
20	0.80	0.34	0.81	0.22	0.03	0.01	0.76	.93
21	0.17	-0.37	-0.45	0.38	-0.01	-0.10	0.65	.94
22	0.60	-0.12	0.02	0.65	0.10	-0.27	0.75	.94
23	0.72	-0.36	0.26	0.88	0.24	0.16	0.68	.94
24	0.56	-0.01	-0.14	0.91	0.10	0.33	0.52	.94
25	0.75	0.11	0.09	0.76	0.37	0.19	0.73	.94
26	0.20	0.11	0.02	-0.16	0.16	0.47	0.57	.94
27	0.60	-0.50	-0.02	0.23	-0.09	0.71	0.55	.94
28	0.73	-0.41	-0.09	-0.01	-0.08	0.81	0.67	.94
29	0.74	-0.19	-0.30	0.34	-0.05	0.87	0.71	.94
Cronbach's α	.91	.87	.83	.88	.94	.81		

Abbreviation: DFS-SF, Diabetic Foot Scale–Short Form.

^aFactor 1: Lesion; Factor 2: Physical health; Factor 3: Dependence/daily life; Factor 4: Negative emotions; Factor 5: Worried about ulcers/feet; Factor 6: Bothered by ulcer care. Bold values indicate the factor of the item.

The item-scale correlations of the Turkish version of DFS-SF ranged from 0.30 to 0.75 (Table 4). In correlation values for test-retest measurement, the lowest correlation was 0.79 and the highest was 0.98, and the correlations were statistically significant ($P < .001$) for all items.

Discussion

In this study, we examined the validity and reliability of DFS-SF in Turkish society. Patients from different sociodemographic groups and different disease-related conditions participated in the study. This provides the generalizability to the study.

Validity

Linguistic validation is the first step of the adaptation of a scale to a community. In this part of the study forward and backward translations were used. The CVI is the most

widely used index in quantitative evaluation.^{14,15} The cut-off for an excellent level in CVI is 0.78. In our study, the CVI value was 0.97 (0.86-1.00). Each item has correlations over 0.30 with the scale. So no revision was required for content validity.

Exploratory factor analysis and CFA were used to determine the construct validity of the Turkish version of DFS-SF. To preserve the original construct of the scale, the analysis was conducted with fixed factors (6 factors). This structure of the scale explained 77.09% of the total variance. It is reported in the literature that values higher than 50% is adequate and acceptable for the factors structure.¹³ In this view, the research team preferred to preserve the original construct.

It is reported in the literature that items with factor load <0.30 should be excluded from the scale.¹³ In the current study, factor loadings of items were between 0.38 and 0.98. So no items were excluded from the scale or moved to another factor.

Reliability

The Cronbach's α internal consistency coefficient, item-scale correlation, and test-retest measurement were used to determine the reliability of the Turkish version of DFS-SF. The values of Cronbach's α consistency coefficient are between 0 and 1. The values close to 1 are considered more reliable. Values between 0.60 and 0.79 are considered as very reliable and over 0.80 is highly reliable.¹⁷ In the original validity and reliability study of the DFS-SF, Cronbach's α values were reported between 0.80 and 0.95. Cronbach's α values were reported between 0.80 and 0.92 in the Chinese version, 0.82 to 0.93 in the Polish version, and >0.70 in the Greek version.¹⁸⁻²⁰ In this study, Cronbach's α values for scale and subscales were between 0.81 and 0.94. The Turkish version of DFS-SF and subscales was found to be highly reliable as in other countries.

Item-scale correlation is a way to determine the relationship between item value and scale value. High values show a high relationship between item and scale. In this analysis, the exclusion of the items with values under 0.30 is recommended in the literature to provide and improve the reliability.¹⁷ The item-scale correlation was reported between 0.63 and 0.84 in the Chinese version and 0.61 and 0.81 in the Polish version.^{18,19} In this study, the item-scale correlations of the Turkish version of DFS-SF were found between 0.30 and 0.75. Similar to the other validation studies of DFS-SF, no item was excluded from the study in item-scale correlations. All items in the Turkish version of DFS-SF were found reliable in this analysis.

Test-retest reliability is used to measure the power of a measurement tool to give consistent results for repeated applications. When the same measurement tool is applied to subjects at different times, the similarity or consistency of the answers given by the subjects to the measurement tool is the indicator of the invariance of that measurement tool.^{21,22} The measurement for the same patients is repeated after 3 weeks. The correlations between the 2 measurements ranged from 0.79 to 0.98. Positive and highly significant correlations were found between the 2 measurements. This shows the internal consistency of the results of scale is not changing according to measurement time and thus the scale is reliable.

This study shows that the Turkish version of DFS-SF is valid and reliable to determine the QoL of diabetic foot patients. The scale is a valid and reliable instrument with its original 6-factor and 29-item structure to measure the QoL of diabetic foot patients in Turkish society.

Limitations

This study is conducted with patients who applied to the hospital. The study was not a community-based study. We recommend repeating psychometric examinations of the study with larger populations.

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Declaration of Conflicting Interests

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