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RESEARCH

A STUDY OF THE VALIDITY AND RELIABILITY OF THE "ELDERLY DIABETES BURDEN SCALE" FOR THE TURKISH SOCIETY

ABSTRACT

Introduction: This study was realized methodologically with the objective of examining the validity and reliability of the "Elderly Diabetes Burden Scale", which was developed in 2003 by Araki and Ito, to determine the burdens stemming from diabetes mellitus in elderly individuals with diabetes, for the Turkish society.

Materials and Method: In the study, based on the fact that the size of the sampling in validity and reliability studies should be a minimum of five-fold and moreover, ideally ten-fold the number of items, 230 elderly diabetics were contacted for the 22-item "Elderly Diabetes Burden Scale".

Results: At the end of the factor analysis applied to the scale, 6 factors were obtained, which explored 74.8% of the total variance of the scale. The Cronbach's alpha value was found to be 0.92 for the internal consistency of the scale and this value shows that the scale is highly reliable.

Conclusion: In conclusion, "Elderly Diabetes Burden Scale" measuring instrument has been found as reliable and valid for the Turkish society.

Key Words: Elderly, Burden of Illness; Diabetes Mellitus; Validity and Reliability.

ARAŞTIRMA

"YAŞLILARDA DİYABETİN YÜKÜ ÖLÇEĞİ"NİN TÜRK TOPLUMU İÇİN GEÇERLİK VE GÜVENİRLİĞİNE İLİŞKİN BİR ÇALIŞMA

ÖZ

Giriş: Bu çalışma, yaşlı bireylerin diyabet hastalığından kaynaklanan yüklerini belirlemek için Araki ve Ito tarafından 2003 yılında geliştirilen "Elderly Diabetes Burden Scale-Yaşlılarda Diyabetin Yükü Ölçeği"nin Türk toplumu için geçerlik ve güvenirliğini incelemek amacı ile metodolojik olarak gerçekleştirilmiştir.

Gereç ve Yöntem: Bu çalışmada geçerlik ve güvenirlik çalışmalarındaki örneklem büyüklüğü madde sayısının en az beş katı ya da ideal olarak 10 katı olması gerektiği bilgisini temel alarak, 22 maddeli "Yaşlılarda Diyabetin Yükü Ölçeği-Elderly Diabetes Burden Scale" için 230 yaşlı diyabetik ile görüşülmüştür.

Bulgular: Ölçeğe uygulanan faktör analizi sonucunda ölçeğin toplam varyansın %74.8'ini açıklayan 6 faktör elde edilmiştir. Ölçeğin iç tutarlılığı için Cronbach Alpha değeri 0.92 bulunmuştur ve bu değer ölçeğin yüksek düzeyde güvenilir olduğunu göstermektedir.

Sonuç: "Yaşlılarda Diyabetin Yükü Ölçeği-Elderly Diabetes Burden Scale" ölçme aracının "nin Türk toplumu için geçerli ve güvenilir olduğu saptanmıştır.

Anahtar Sözcükler: Yaşlı; Hastalık Yükü; Diabetes Mellitus; Geçerlik ve Güvenirlik.

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INTRODUCTION

The elderly population is also increasing in Turkey, just as it is throughout the world. In our country the estimated population 65 years of age and older is expected to be 9.0% for 2025 and 18.4% for 2050. The aging of the population is a demographic problem, which has never been encountered in Turkey up until the present-day (1,2). Along with the lengthening of the lifespan, the prevalence of the number of elderly individuals with chronic diseases has also increased. Diabetes Mellitus is also one of the diseases, which is in the lead among the chronic diseases (3). In the Turkish Diabetes Epidemiology Study (TURDEP) made by Satman et al., it was found that the prevalence of Diabetes Mellitus in our country is 7.2% (4). The elderly diabetics frequently have general psychological problems, such as depression caused by being elderly and poor well-being as well as the complications of diabetes and experience the burden related to diabetes due to the treatment of diabetes and the other chronic diseases, which accompany it (5-7).

While being elderly constitutes a burden, even if it is physiological, diabetes mellitus and its complications, which are added to the process of aging, constitute a second burden for the individuals and thus, they are confronted with a much greater burden compared to young people or adult diabetics. Consequently, coping with this additional burden created in the elderly by a chronic disease, accepting the disease, adjusting to treatment, self-care and self-effective skills are much more difficult in the elderly compared to young diabetics. Naturally, this situation makes it necessary to develop treatment and care connected to that burden and the burden at different dimensions by being influenced by the individual characteristics of every elderly person, by his/her socioeconomic level, other health problems, feelings of loneliness or requirements for care (6,7).

It is thought that in the light of these results it would be beneficial to measure the diabetic burden for being able to implement the correct treatment and care unique to the elderly diabetic individuals and from the results obtained to plan and implement special treatment and care for the elderly. It is thought that awareness and revealing the burden is important, both for the health professionals and for the elderly individuals.

"The Elderly Diabetes Burden Scale", which was developed in Japan in 2003 by Atsushi Araki and Hideki Ito and was translated to Turkish by experts, is a measurement tool, which aims to measure the burden in elderly diabetic individuals. Furthermore, another measurement tool related to this subject was not encountered in a detailed study of the literature. This measurement tool both emphasizes the importance of the subject and is also of importance for eliminating a significant deficiency for the elderly diabetic individuals (5).

The objective of this study was to investigate whether or not the "Elderly Diabetes Burden Scale (EDBS)" is a reliable and valid tool for the Turkish society.

MATERIALS AND METHOD

Sampling

In the study, based on the fact (8) that the size of the sampling in validity and reliability studies should be a minimum of five-fold and moreover, ideally ten-fold the number of items, 230 elderly diabetics were contacted for the 22-item "Elderly Diabetes Burden Scale" (n= 230). Elderly diabetic individuals, who were 65 years of age and older, who had been diagnosed to have diabetes a minimum of two years ago, who did not have eyesight and hearing problems, who were able to establish verbal communications and who received 24 or more points on the Mini Mental Status Test were included in the study (Table 1). The Kaiser-Meyer-Olkin (KMO) values were used for the sufficiency of the sampling in the analyses and the KMO coefficient of 0.89 was excellent and the result of the Bartlett's test was found to be significant at an advanced level (X^2=3813.488; p<0.001) (8).

Data Collection

Written permission was obtained from the institutions where we collected data (Study; the Diabetic Polyclinic at the Ege University, Medical Faculty Hospital; the Internal Diseases Polyclinics at the Dokuz Eylül University, Medical Faculty Hospital; the Narlidere Rest Home and Care Facility; the Bornova Nevvar & Salih Isgoren Retirement Home; the Buca Retirement Home, Elderly Care and Rehabilitation Center; and the Izmir Retirement Home, Elderly Care and Rehabilitation Center); from the Ethics Board of the Ege University, Nursing School of Higher Education; from Atsushi Araki, who developed the "Elderly Diabetes Burden Scale", for translating it to Turkish and applying it in Turkey; and from the elderly individuals. In the study, the Sociodemographic Characteristics Questionnaire, the "Elderly Diabetes Burden Scale", which was developed by Araki and Ito (2003), the "Geriatric Depression Scale" (9) and the "Mini Mental Test" (10) were used for the elderly diabetic individuals. The study data

Table 1— Information Related to the Elderly Diabetic Patients Participating in the Study (n=230).

Information	n	%
Sex		
Female	129	56.1
Male	101	43.9
Age		
65-70	105	45.7
71-80	86	37.4
81 and Above	39	17.0
Marital Status		
Married	102	44.3
Single	21	9.1
Widow / Widower	107	46.5
Educational Level		
Primary School	142	61.7
High School	48	20.9
University	40	17.4
Form of Treatment		
Oral antidiabetic	151	65.7
Insulin	79	34.3
Health Insurance		
Retirement Fund	151	65.7
Social Security Admin	47	20.4
Bag Kur Social Security	23	10.0
Green Card	9	3.9
Chronic Disease		
Yes	164	71.3
No	66	28.7
Institution		
Ege University	41	17.8
Dokuz Eylül University	50	21.7
Retirement Home	139	60.4
Income Level (per month) (TL)		
100-499	62	27.0
500-999	147	63.9
1000 and above	21	9.1
Period of Diabetes (years)		
1-10	132	57.4
11-20	67	29.1
21 and longer	31	13.5
Total	**230**	**100.0**

was obtained by the researchers through face-to-face interviews with the elderly diabetic individuals between December 2006 and June 2007. The interviews with the elderly diabetics lasted for approximately 30-40 minutes.

RESULTS

First of all, language equivalence was provided in the validity analyses of the "Elderly Diabetes Burden Scale". The translation/back translation method was used for testing the language validity of the scale (11-15). The Turkish form, which constitutes the scale, was given to a total of 11 experts, with nine nurse teaching staff members and two nursing experts in diabetics, who were related to the subject, for evaluating from the aspect of the validity of scope (16-18). The Content Validity Index (CVI) developed by Waltz and Bausell (1981) was used in the evaluation of the expert views (19). According to this index, the experts evaluated the items as (1. unsuitable {1 point}, 2. it is necessary to make the item into a suitable form {2 points}, 3. it is suitable, but a small change is needed {3 points} and 4. very suitable {4 points}). No items were removed from the scale, because there was no item whose average was under two according to the views of the experts.

The preliminary application of the scale, for which a consensus of opinion was reached by the experts, was applied to 10 elderly diabetic individuals. At the conclusion of the preliminary application, since two items in the scale were perceived to be the same by the elderly diabetic individuals, (item 19 - "How pleased are you with the laboratory results of your diabetic treatment, by also including glucose control?" and item 20 - "How pleased are you with your blood glucose levels?"), it was decided to put the two items together, "How pleased are you with the blood sugar and laboratory results of your diabetic treatment?"

Giving Points to/Scoring the Items

The "Elderly Diabetes Burden Scale", which we adapted to the Turkish society, is a 22-item Likert-type (0-4) scale. The scale is composed of 6 sub-factors: symptom burden (4 items), social burden (5 items), burden stemming from dietary restrictions (4 items), burden stemming from anxiety about diabetes (4 items), burden related to treatment displeasure (2 items) and the burden stemming from oral antidiabetics or insulin (3 items). The total "Elderly Diabetes Burden Scale" points (18-88 points) are calculated by adding the six sub-scale scores and by reversing the treatment satisfaction sub-scale scores. High points on the scale show a high burden and low points on the scale show a low burden (5).

Reliability

Reliability, which is one of the important technical characteristics of the measurement tool, "is an indicator of to what extent it measures with determination the characteristic or characteristics measured by the measurement tool" and is a ma-

jor criterion in the evaluation of the quality of the scale (18). Internal consistency, item analysis and split-test reliability techniques were utilized in the determination of the reliability of the scale.

The Cronbach's Alpha coefficient, which shows the internal consistency reliability coefficient of the scale, was 0.92 and the scale was found to be highly reliable (8). The sub-dimensions of the scale were found to be 0.55 for "Symptom Burden", 0.87 for "Social Burden", 0.95 for "Burden Stemming from Dietary Restrictions", 0.94 for "Burden Stemming from Anxiety About Diabetes", 0.82 for "Burden Related to Treatment Displeasure" and 0.87 for "Burden Stemming from Oral Antidiabetics or Insulin".

In the split-test reliability analysis of the scale, the correlation between the two halves of the 22-item "Elderly Diabetes Burden Scale" was 0.71. The Cronbach's Alpha coefficient of the first half (11 items) was found to be 0.82, the Cronbach's Alpha coefficient of the second half (11 items) was 0.91, the Spearman-Brown coefficient was 0.83 and the Guttman Split-Half coefficient was found to be 0.83.

Construct Validity

In the studies for developing or adapting scales, construct validity is very important and it is of primary importance in scales for construct validity and it was stated that it is the heart of validity and it is the second major criterion in the evaluation of the quality of the scale (12). Scope/content validity aims to measure the measurement scale of the items or questions within the measurement scale and is the degree to which the subjects are represented in a balanced manner (8,18). In this study, techniques were used for scope validity, such as obtaining expert views, factor analysis, testing hypotheses and comparison of the known groups for evaluating scope validity (17-22).

Factor analysis is a procedure made to evaluate whether or not the items in the scale can be collected under different dimensions (8,18). Exploratory factor analysis was used when making the factor analysis of the scale, since the original structure of the scale was changed at the adaptation stage in our country and since 2 items were combined in 1 item (17). The factor structure of the scale was examined with the Principal Component Analysis with Orthogonal Varimax rotation and it was shown that it reached 6 factors in conformance with the original scale factor structure of the "Elderly Diabetes Burden Scale" (14-16). Furthermore, the items located in the scale were like those in the original scale and were found to be under the same six sub-factors. When the factor loadings of the items located under each factor were examined, it was observed that the factor loadings of the items were high. Since there was no factor item, which was below the factor loadings of 0.30 among the scale items, there was also no item removed from the scale. The item, "How much does it disturb you to see unclearly?", which is under Factor 6, was found to be at the lower limit with an 0.36 factor loading. The item, "How much does it disturb you to see unclearly?" was located under factor 1 and factor 6 with close values and conceptually, it was decided to locate it under factor 6.

The variance explored by every factor was between 4.86 % and 40.49 % and it explored 74.8% of the total variance. This is a variance value at a good level. Moreover, it is a higher value than that of the original form of the scale. The original form of the scale explored 69.4% of the total variance (Table 2).

Testing the hypothesis is also a technique used frequently in construct validity. In the Panel to Develop the Care of Elderly Diabetic Individuals of the California Healthcare Foundation and the American Geriatric Association (2003)(21), the risk of depression increased in elderly diabetic individuals and scales, such as the Geriatric Depression Scale and the Beck Depression Scale could be used with the objective of determining this condition. In the study, by studying and examining the literature (8,23-27) related to the subject for the testing of the hypothesis, it was found that there was a direct and medium level (0.58) ($p<0.001$) relationship for all of the scales between the point averages of the "Elderly Diabetes Burden Scale" and the point averages of the "Geriatric Depression Scale" when the correlation of the points obtained in both scales were implemented with the "Geriatric Depression Scale". This relationship was evaluated as data, which contributed to the validity of the scale (14).

Another method used in the determination of the construct validity of the scale is a comparing of the total point of Diabetes Burden Scale with independent variables. In this study; age, gender, marital status, educational level, period of having diabetes mellitus, health insurance, the existence of another chronic disease and the method of treatment were considered as independent variables. The relation between the total point of the scale and the independent factors were evaluated with independent samples t test or one way analysis of variance following by post hoc tests. The results of these tests were given in Table 3.

Discussion

This study describes the psychometric analysis and the adaptation to Turkish of the "Elderly Diabetes Burden

Table 2— The Results of Elderly Diabetes Burden Scale Principal Component Analysis

Factors	Item Number	Factor Loading	Eigenvalue	Percentage of Variance Explained
FACTOR 1				
Social Burden (Total Score: 5-20)				
How much do you feel that your diabetes disturbs the relationship with your family?	B1	0.67		
How much do you feel that your diabetes disturbs the relationship with your friends?	B2	0.77		
How much do you feel that your diabetes disturbs your jobs (social activity) or house-keeping jobs?	B3	0.78	8.90	40.49
How much do you feel that your diabetes disturbs your life in general?	B4	0.67		
How much do you feel that your diabetes disturbs your leisure activities?	B5	0.78		
		Cronbach alpha: 0.87		
FACTOR 2				
Dietary Restrictions (Total Score: 4-16)				
How often do you have burden with caloric restriction?	C1	0.86		
How often do you have burden with the restriction of favorite food?	C2	0.89	2.29	10.42
How often do you have burden with dietary management itself?	C3	0.89		
How often do you have burden with taking well-balanced food?	C4	0.87		
		Cronbach alpha: 0.95		
FACTOR 3				
Worry About Diabetes (Total Score: 4-16)				
How often do you have worry about living with diabetes?	D1	0.75		
How often you have worry about having severer diabetic complications in the future?	D2	0.84		
How often do you have worry about the disability in the future due to diabetes?	D3	0.86	1.79	8.14
How often do you have worry about having much more burdensome diabetes treatment in the future?	D4	0.79		
		Cronbach alpha: 0.94		
FACTOR 4				
Burden By Tablets Or Insulin (Total Score:3-12)				
How much do you have burden with taking pills for diabetes or injecting insulin?	F1	0.76		
How much do you feel worry about hypoglycemia due to tablets for diabetes or insulin therapy?	F2	0.82	1.22	5.58
How much do you feel worry about changing dose of tablets or insulin for diabetes if you have a sick day?	F3	0.83		
		Cronbach alpha: 0.87		
FACTOR 5				
Treatment Dissatisfaction (Total Score:2-8)				
How much are you satisfied with all aspects of diabetes treatment?	E1	0.84	1.18	5.37
How much are you satisfied with your blood glucose levels?	E2	0.84		
		Cronbach alpha: 0.82		
FACTOR 6				
Symptom Burden (Total Score:0-16)				
Do you have a swelling in your legs?	A1	0.76		
Do you have a frequent urination?	A2	0.51	1.07	4.86
Do you have a numbness?	A3	0.61		
Do you have a blurry vision?	A4	0.36		
		Cronbach alpha: 0.55		
Scale Total Score: 18-88	**Total Cronbach alpha: 0.92**			

Table 3— Comparison of Elders' Total Point Obtained from Elderly Diabetes Burden Scale with Independent Variables

Age groups	**n**	**X±sd**	**F**	**p**
65-70***	105	10.73±7.05		
71-80	86	8.79±5.97	6.117	**0.003****
81 and over	39	6.76±4.68		
Gender	**n**	**X±sd**	**t**	**p**
Female	129	43.24±16.79	2.102	**0.037***
Male	101	38.57±16.65		
Marital status	**n**	**X±sd**	**F**	**p**
Married****	102	44.27±17.47		
Single	21	36.57±19.56	3.331	**0.038****
Widow	107	39.16±15.27		
Educational level	**n**	**X±sd**	**F**	**p**
Primary ***	142	45.05±16.94		
High school	48	37.33±16.80	11.787	**0.001****
University	40	32.12±11.54		

*the t test in independent groups, **the one way analysis of variance, ***tamhane's test, ****bonferroni test.

Scale" in elderly diabetics living in Turkey. The scale was transformed from 23 items to 22 items during the stage of adaptation to Turkish.

The reliability results of the scale were also in conformance with the original values of the scale and higher results were obtained compared to the original scale. The Cronbach's Alpha coefficient was 0.92, which shows the internal consistency reliability coefficient for the scale and it shows that the scale is highly reliable (8). The symptom burden sub-dimension of the scale showed a lower internal consistency level, both in the original form of the scale and in the form adapted to our country (5). It is thought that this situation stems from not always seeing symptoms of diabetes mellitus in diabetic patients at the same time and this result is an expected result.

The result of the split-test reliability analysis of the scale also supports the reliability of the scale. The reliability analysis results of the scale were evaluated as data, which shows that the internal consistency of the scale is high (8). The findings of the validity analysis of the scale showed that the scale is also valid (13,15). It was observed in the factor analysis that the factor loadings were high. The variance explored by each factor was between 4.86 and 40.49 and 74.8% of the total variance was explored. This is a variance value at a good level (13,15). Moreover, it is a higher value than in the original form of the scale. The original form of the scale explored 69.4% of the variance.

It was found that there was a direct and medium level (0.58) ($p<0.001$) relationship for all of the scales between the point averages of the "Geriatric Depression Scale" (14).

At the end of comparing the known groups with the scale, findings were obtained that also provided evidence for the construct validity of the scale.

A meaningful difference was found between the groups when examined related to One-Way Anova Analyse, of the total point averages of "Elderly Diabetes Burden Scale" which elderly people graded it according to year groups. It was determined that the difference was due to 65-70 year group at detailed analyse (Tamhane Test). At the original form of scale, a statistically meaningful difference wasn't found between years and the total point average.

A meaningful difference was found between the groups when examined according to "t test" for independent groups, the total point averages of "Elderly Diabetes Burden Scale", elderly people graded it related to sex. At the original form of the scale, the total point averages of the scale were not found to be of statistically meaningful difference between the diabetic men and diabetic women.

When it was examined related to One-Way Anova Analyse, the total point averages of "Elderly Diabetes Burden Scale" which elderly people graded it according to their civil situations, a meaningful difference was found between the groups. At the detailed analysis (Benforonni test), it was found that the difference was due to the married group. At the original form of this scale, the marital situation wasn't taken among the variables.

When it was examined related to One-Way Anova Analysis, the total point averages of "Elderly Diabetes Burden Scale" which elderly people graded it related to the situation of

education, a meaningful difference was determined between the groups. At the detailed analysis (Tamhane Test), it was found that this difference was due to primary education.

Based on all of these data obtained from the analyses, the conclusion was reached that the "Elderly Diabetes Burden Scale" developed by Atsushi Araki and Hideki Ito is a tool that has a high validity and reliability to be used in the Turkish society. It is proposed to be used for the determination of the burdens of the elderly diabetic individuals in our country as well. In connection with this, it is thought that the "Elderly Diabetes Burden Scale" would be appropriate for planning and arranging the required treatment and care for measuring and lessening the burdens of the elderly diabetic individuals and that it would fill a void in this field. It is proposed that these types of studies are made by the idea that there could be many global concepts at the adaptation stage of the scales developed in different cultures that could be measured and that it would provide the opportunity for international and intercultural comparisons and discussions.

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