

# Diabetes Burden and Activation Levels in Elderly Individuals with Diabetes

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## ABSTRACT

**Objective:** This research has been conducted to determine the diabetes burden and patient activation levels in elderly individuals with diabetes.

**Methods:** The sample of this descriptive study is composed of 230 individuals aged 65 years and over and individuals with a diagnosis of diabetes. Data has been collected at the internal medicine clinic of a state hospital between May 2021 and January 2022. Data collection has been collected using the Personal Information Form, Elderly Diabetes Burden Scale and Patient Activation Measure.

**Results:** It has been determined that 37.4% of geriatric diabetics were at the first activity level, and 14.3% at the second activity level. The average Patient Activation Measure score has a significant correlation with Elderly Diabetes Burden Scale. It has been determined that the situation of age, high school degree or a higher level of education, lack of any acute or chronic complications, another chronic disease, having a diabetes education, use of oral antidiabetic medications and total elderly diabetes burden have a significant effect on activity levels.

**Conclusions:** This study, it has shown that the burden of diabetes in geriatric patients has a significant difference by the patient activity levels.

**Keywords:** Activation Level, Diabetes, Burden, Elderly

## 1. INTRODUCTION

There are approximately 537 million adults living with diabetes in the world and it is predicted that this number will increase to 783 million in 2045. In Turkey, there are nearly 7 million individuals with diabetes between the ages of 20-79 according to the data of 2020, and nearly 20% of this number composes of those individuals over the age of 65 (1, 2). Diabetes is one of the most common chronic diseases in geriatric individuals notwithstanding, it is an increasingly important burden on geriatric individuals since it brings about organ damage, causes addiction and reduces quality of life (2-4). The burden of diabetes is felt more in geriatric individuals, particularly owing to the physiological changes caused by old age, poor well-being and other existing chronic diseases (5, 6). Studies conducted in this field have indicated that increased diabetes burden in geriatric individuals increases the risk of mortality and morbidity, causes drug non-compliance, and has a significant correlation with variables that negatively affect diabetes management, such as high HbA1c level, insufficient exercise, and poor self-efficacy (2-4, 7).

It has been specified that it is crucial to reduce the burden of diabetes on geriatric individuals, and for this, individuals

should be empowered and self-management levels should be increased. The most efficient method to increase self-management in diabetes patients is possible by assuring the active participation of the individual and family in treatment (8-11). Patient activation is closely connected with many conditions such as maintaining healthy lifestyle behaviors, predicting health outcomes, and individuals having the ability to make decisions about their health conditions (12-14). High levels of patient activation have been detected as being connected with positive health outcomes (for example, fewer depressive, more frequent use of healthcare services, and glucose levels target). Conversely, lower patient activation levels are connected with unhealthy behaviors (eg, physical inactivity) and less positive health outcomes (eg, higher glucose levels) in individuals with type 2 diabetes (12, 13).

Type 2 diabetes is a complex chronic condition that necessitates continuous care. For this reason, a high degree of self-management and high activity levels are required to improve outcomes and prevent diabetes-related complications (15). In the literature review using the

keywords diabetes burden, elderly, and patient activity level, even though there are a few studies evaluating the diabetes burden, it has been detected that there is not any study in the literature forming an estimate of patient activity levels in individuals with geriatric diabetes, and there is no any available study that evaluates diabetes burden and patient activity levels together (5,16-18). Accordingly, our objective in this study is to determine the diabetes burden and patient activity levels in individuals with diabetes geriatric.

## 2. METHODS

### 2.1. Design and Sample

This study was conducted as a descriptive study to determine the diabetes burden and patient activity levels in geriatric diabetics.

The study population consists of individuals with geriatric diabetes who applied to a state hospital's internal medicine clinic. G power analysis was utilized to calculate the sample number of the study. Based on the study conducted by Koşar et al. (2018), 192 individuals were planned to be included in the study, according to the calculation made by utilizing patient activity level scores, one of the main outputs of the study, at 80% power ( $1-\beta$ ), 95% confidence ( $1-\alpha$ ) range and 0.35 effect level (14).

The sample of the study consists of those who are 65 years or older, diagnosed with type 1 and type 2 diabetes for at least one year, who were hospitalized in the internal medicine clinic of a state hospital, did not have any cognitive problems, did not have any psychiatric diseases, and has presented written and verbal consent for participation in research after they received information about the research.

### 2.2. Procedures

Data were obtained at patient rooms in the internal medicine clinic through face-to-face and personal interviews. Out of 249 patients contacted between May 2021 and January 2022, They were not included in the sample as 2 of them had a psychiatric disorder, 2 of them were not capable of facilitating self-care activities, 4 of them felt tired and 11 of them did not give consent for participation in the study. The study was completed with 230 patients.

### 2.3. Instruments

Data were collected by using a personal information form, Diabetes Burden Scale and Patient Activation Measure.

*In the personal information form*, gender, marital status, age, education level, income status, duration of diagnosis, diabetes treatment, diabetes-related acute/chronic complication development status, presence of additional chronic disease, physical exercise status, and diabetes education status have been assessed.

*The Elderly Diabetes Burden Scale*, which was developed to identify the diabetes burden of individuals with geriatric diabetes, consists of 6 sub-items and a total of 23 items. The sub-dimensions of the scale are symptom burden, dietary restriction, worry about diabetes, treatment dissatisfaction, burden by tablets or insulin, and social burden. Responses in scale; "no; 0 points", "If yes, none: 1 point; very little: 2 points; a little: 3 points; a lot: 4 points". A high score on the scale reveals that there is a high diabetes burden. The highest score that can be obtained from the scale is 88 and the lowest score is 18. The validity and reliability study of the Elderly Diabetes Burden Scale was conducted by Yıldırım and the Cronbach alpha value was determined as 0.92 (19).

*Patient Activation Measure (PAM)*, which was developed to evaluate the patient activity levels of individuals with chronic diseases, consists of 13 items. The scale consists of four stages. Individuals who think that they are not yet active participants in taking an active role in their healthcare and care are situated in the first stage. Individuals lacking in knowledge and unable to establish a connection between their health and the recommended health arrangement are situated in the second stage. Individuals who are able to take action and eager but lack the skills and confidence to support new attitudes are situated in the third stage. Patients who accept new attitudes but are unable to preserve and maintain these attitudes in health crises and stress situations are situated in the fourth stage. The activity scores obtained from the measurement tool ranged between 0-100. Level 1: lowest activity: <47 points, Level 2: 47-55 points, Level 3: 55 – 72 points, Level 4: highest activity:>72.5 points (13). The validity and reliability study of the scale in Turkish was conducted by Koşar & Besen and the cronbach alpha value was determined as 0.81 (14).

### 2.4. Statistical Analysis

The data analysis has been implemented by using the IBM SPSS Statistics 18 program. Since parametric test assumptions were not provided, Mann Whitney U test was used for comparisons of two groups median, Kruskal Wallis test and post hoc Bonferroni tests were used for comparisons of means of more than two groups. The relationship between continuous variables was examined with the Pearson correlation test. Univariate and multivariate regression analysis was performed for the factors affecting the activity level and variables with  $p<0.05$  were included in the multivariate model. In the study, the statistical significance level has been accepted as  $<0.05$ .

### 2.5. Ethical Consideratin

Ethics committee approval was obtained from a university non-invasive clinical research ethics committee before starting the study (Date: April 8, 2021 Decision no: 50). Institutional permission was obtained from the Provincial Health Directorate to conduct the research. Written and verbal consent was obtained from the individuals who agreed to participate in the study.

### 3. RESULTS

The statistical power of the study has been determined as 90%, with a 95% confidence interval,  $d=0.43$  effect size, according to the result of the post hoc power analysis calculated at the end of the study. The mean age of geriatric diabetic individuals is  $73.46\pm 7.06$ , 46.5% are female, 53.5% are male, the majority (72.2%) are married, and 38.7% are high school graduates. It has been detected that 93.5% of the individuals participating in the study have been diagnosed with type 2 diabetes and the mean year of diagnosis was  $20.95\pm 9.82$ , 47.0% used only insulin therapy, 34.8% used oral antidiabetic and insulin therapy together (Table 1).

It has been determined that the mean PAM score of individuals with geriatric diabetes is  $53.33\pm 14.49$ . The majority of the individuals have been in the first stage (37.4%) with the lowest patient activity level, 14.3% have been in the second stage, 34.4% have been in the third stage, and 13.9% have been in the fourth stage with the highest activity level (Table 2).

It has been determined that the average scores of the "symptom burden", "dietary restriction", "worry about

diabetes", "burden by tablets or insulin" and "total elderly diabetes burden scale of the individuals with the activity level 1 were higher than the individuals with the activity level 3 and 4, It was determined that the average "social burden" and "treatment dissatisfaction" scores of the individuals with activity level 1 were higher than those with activity level 2, 3 and 4 ( $p<0.05$ ) (Table 3).

In the Logistic Regression model, in which patient activity levels were the dependent variables, diabetes burden scale and descriptive features were independent variables, it was determined that the independent variables and total diabetes burden explained 67.2% of the total variance in activity levels ( $p<0.05$ ). When the regression coefficients were examined, age ( $OR=0.957$ ), education level being high school and above ( $OR=7.036$ ), no acute complication ( $OR=23,536$ ), no chronic complication ( $OR=18.501$ ), no other chronic disease ( $OR=4.071$ ), diabetes education ( $OR=20.245$ ), oral antidiabetic use ( $OR=4.030$ ) and total elderly diabetes burden ( $OR=0.903$ ) had a significant effect on activity levels ( $p<0.05$ ) (Table 4).

**Table 1.** Distribution of disease-related characteristics of individuals

Disease-related characteristics	n	%
<b>Types of Diabetes</b>		
Type 1	15	6.5
Type 2	215	93.5
<b>Individual with diabetes in the family</b>		
Yes	187	81.3
No	43	18.7
<b>Diabetes treatment</b>		
Oral antidiabetic	80	34.8
Insulin	108	47.0
Insulin and oral antidiabetic medication	42	18.2
<b>Acute complication</b>		
Yes	185	80.4
No	45	19.6
<b>Chronic complication</b>		
Yes	73	31.7
No	157	68.3
<b>Other chronic disease</b>		
Yes	171	74.3
None	59	25.7
<b>Diabetes education</b>		
Yes	69	30.0
No	161	70.0
	<b>Mean<math>\pm</math>SS</b>	<b>Median (Min-Max)</b>
<b>Diagnosis time</b>	20.95 $\pm$ 9.82	19(6-63)

**Table 2.** Distribution of patient activity levels of individuals

Activity levels	n	%
First level	86	37.4
Second level	33	14.3
Third level	79	34.4
Fourth level	32	13.9

**Table 3.** Diabetes burden scores according to activity levels

Elderly Diabetes Burden Scale	Activity Levels				p*	Difference
	First Level Median (Min-Max)	Second Level Median (Min-Max)	Third Level Median (Min-Max)	Fourth Level Median (Min-Max)		
Syptom burden	12 (2-16)	11 (0-16)	8.96 (0-16)	6 (0-14)	<0.001	1>3-4 2,3>4
Social burden	19 (11-20)	18 (10-20)	15 (8-20)	15 (10-20)	<0.001	1>2,3,4
Dietary restrictions	13 (8-16)	12 (4-16)	12 (6-16)	12 (7-16)	<0.001	1>3,4
Worry about diabetes	14 (8-16)	14 (8-16)	12 (6-16)	12 (8-16)	<0.001	1>3,4
Treatment dissatisfaction	6 (2-8)	4 (2-8)	4 (2-7)	2 (2-6)	<0.001	1>2,3,4 2, 3>4
Burden by OAD or insulin	11 (6-12)	11 (7-12)	9 (4-12)	8.5 (6-12)	<0.001	1>3,4 2 >4
Total Elderly Diabetes Burden Scale	74 (45-124)	68 (39-80)	62 (37-79)	55.5 (40-74)	<0.001	1>3,4 2 >4

\*Kruskal Wallis test

**Table 4.** Analysis of logistic regression for factors affecting activity levels

Activity level (2-4) Variables	Univariate	
	OR (%95 CI)	p
Gender (male)	1.291 (0.767-2.170)	0.336
Age (year)	0.957 (0.921-0.994)	0.025
BKI (kg/m <sup>2</sup> )	0.951 (0.902-1.002)	0.061
Marital status (single)	0.849 (0.476-1.514)	0.579
Education degree (high school and the BA)	7.036 (3.939-12.569)	<0.001
Cohabitation (spouse or child)	1.076 (0.499-2.322)	0.851
Type of Diabetes (type 2 diabetes)	0.602 (0.207-1.749)	0.351
Any family member with diabetes (no)	0.867 (0.447-1.683)	0.673
Acute complication (not available)	23.536 (7.028-78.819)	<0.001
Chronic complication (not available)	18.501 (7.936-43.131)	<0.001
Other chronic disease (not available)	4.071 (2.124-7.802)	<0.001
Diabetes training (yes)	20.245 (8.648-47.392)	<0.001
Treatment (oral antidiabetic)	4.030 (2.252-7.214)	<0.001
Total Elderly Diabetes Burden Scale	0.903 (0.876-0.930)	<0.001

Nagelkerke R Square: 0.672

## 4. DISCUSSION

### 4.1. Discussion of Patient Activity Levels

Patient activity in diabetes is the basis of gaining self-management behaviors and successful diabetes management (20). In the study of Hendricks and Rademakers with individuals with chronic diseases; it was found that 23% of the patients were at the first level, 23% at the second level, and 31% at the third level (21). In our study, it was determined that the majority of geriatric diabetics were in the first stage (37.4%), which is the lowest activity level, and only 13.9% were in the fourth stage, which is the highest activity level. The results of the study show that the activity levels of geriatric diabetic individuals are not at the desired level.

One of the most important factors affecting patient activity in diabetes management is advanced age (21). In the study

of Bostouwen et al., a significant difference was found between age and activity scores (22). In the study of Magnezi and Glasser, there was no significant relationship between age and patient activity levels (23). In this study, it was determined that there was a negative significant relationship between the age of individuals with geriatric diabetes and their activity levels, and the activity levels decreased as the age increased. The decrease in all functional living areas with increasing age and other comorbid diseases may have negatively affected the activity levels. The results of the research reveal the necessity of planning different activation initiatives for geriatric individuals.

It has been found that the education level of individuals is closely related to active participation in treatment (14). In

the study of Yadav et al., it was determined that the level of activity of individuals with COPD decreases as the education level decreases (24). Similar to the literature, it was found that the activity scores of individuals with diabetes who were at undergraduate or higher education level were higher. As the level of education increases, reaching, acquiring and using information gradually increases, and this may have positively affected the activity levels of individuals.

An individual with diabetes is expected to be able to perform treatment practices and adapt to lifestyle changes in patient activation (8). In this study, it was determined that the activity levels of individuals using only oral antidiabetic or only insulin were higher than individuals using both treatment methods. In diabetes management, people may need to change their lifestyle or take oral antidiabetic treatments to reach target HbA1c levels. Individuals using insulin therapy should monitor their blood sugar regularly, inject the correct insulin dose. The necessity of multiple activation applications may have caused a decrease in activation levels in individuals using both treatment methods.

Diabetes gives rise to organ and function losses owing to the complications it develops in the individual and negatively affects the quality of life (10). In our study, it was detected that the mean PAM scores of individuals with acute and chronic complications were lower than those without complications. Considering that individuals' adherence to treatment increases as their activation levels increase, it is thought that successful diabetes management and high activation reduce complications, while low activation increases complications.

Multiple chronic diseases make the medical management of the disease more challenging, which increases the burden of disease in individuals. It was determined that the activity levels of diabetic individuals with additional chronic diseases were lower (25). It was determined that the mean PAM scores of individuals with other chronic diseases were lower. In addition to diabetes, individuals may have difficulty in maintaining multiple treatment and care practices due to other chronic diseases, and this may be the reason for low patient activity.

#### 4.2. Discussing the Relationship Between Patient Activity Level and Diabetes Burden

It has been stated that to minimize the negative effects of the disease and improve the quality of life in individuals with diabetes, self-management should be increased and patient activation should be provided for this. Studies in the literature have shown that patient activation is associated with healthy lifestyle behaviors, disease complications, and healthcare use (26, 27). In a study by Cibeles et al., individuals with high levels of activity were found to be more likely to exercise regularly, eat healthy, participate in their self-care, and apply to the emergency department less frequently (28). The fact that individuals with high activity levels had lower diabetes burdens in our study is compatible with the literature. It is thought that individuals with high levels of activity cope with the disease and adapt to the current situation with their active participation in treatment and care.

Patient activation is also important for the emotional management of illness. Sacks et al. concluded that individuals with high patient activity had lower levels of depression (26, 27). In our study, it was determined that the burden arising from anxiety had a negative and significant relationship with patient activation levels.

Patient activation influences health behaviors across a wide range of outcomes, such as health information use and the ability to make health-related or treatment-related decisions. It has been reported that individuals with diabetes at activity levels 2 and 4 have much more information about their existing diseases than individuals at level 1, and they have a higher frequency of foot and eye control in the last 12 months (21, 29). In other studies, it was found that higher patient activation was associated with better biometric values such as normal blood pressure and lower lipid levels, and also reduced hospitalizations and emergency room visits (9, 12, 25). In our study, it was found that patient activation levels were negatively correlated with treatment-related burdens such as disease symptoms, insulin, and diet.

## 5. CONCLUSION

The most important strategy to improve self-management in chronic diseases is to provide patient activation or involve patients in their care. In this study, patients with diabetes were found to have low patient activation levels. Increasing interest in providing individual care has made the concept of patient activation and the factors affecting it important. In this study, it was determined that patient activation was affected by diabetes burden and some patient characteristics. In line with the results; It is recommended to monitor the activity of individuals with diabetes at regular intervals over time, to reduce the diabetes burden of geriatric individuals with low activity levels, to increase the supportive practices aimed at reducing the diabetes burden and increasing their activity levels.

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