

The relationship between diabetes burden and successful ageing in diabetic elderly patients

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SUMMARY

OBJECTIVE: The aim of this study was to determine the diabetes burden in elderly individuals along with successful ageing, which defines how well individual ages contribute to coping with the disease and diabetes management. This study also aimed to evaluate the relationship between diabetes burden and successful ageing in elderly individuals with type 2 diabetes.

METHODS: The data for this descriptive study were collected from 526 individuals who were 65 years old patients diagnosed with type 2 diabetes in the diabetes polyclinic of a research and training hospital between January and June 2021.

RESULTS: It was found that the Successful Ageing Scale score was higher in women, those who had regular diabetes control, and those who had easy access to health services. Elderly Diabetes Burden Scale scores were found to be higher in men, those whose diabetes treatment was insulin, and those with poor perceived health status. No statistically significant relationship was determined between the Elderly Diabetes Burden Scale total score and the Successful Ageing Scale total score ($p>0.05$).

CONCLUSION: Accordingly, by enabling the elderly to have easy access to healthcare services, preventing complications, and providing elderly healthcare services, it will be possible to reduce the diabetes burden in the elderly and enable them to age successfully.

KEYWORDS: Disease burden. Diabetes mellitus, type 2. Healthy aging. Aging.

INTRODUCTION

Type 2 diabetes is a prevalent chronic disease that can be observed in all societies, especially in adulthood; it threatens the patient's ability to sustain an independent life, has a significant effect on the patient and the family, follows a course full of complications, can lead to organ damage when not treated well, severely reduces the quality of life, and has a relatively high cost¹⁻³. According to the data of the International Diabetes Federation, 537 million adult individuals (20–79 years old) had diabetes worldwide in 2021, and this number is estimated to rise to 783 million by 2030². The prevalence of diabetes in Turkey is similar to the world data, and its prevalence increased from 7.7 to 13.7%, with an increased rate of 90% between 1998 and 2010⁴. It has also been reported that type 2 diabetes makes up 90–95% of the total number of diabetes cases, and its prevalence in the elderly population is approximately 32%¹.

Along with the ageing process, both the burden brought about by chronic diseases and coping with several emotional, spiritual, and social problems are among the important issues in a successful ageing process^{5,6}. Successful ageing is associated with factors

such as avoiding diseases, physical and mental functionality, active participation in life, absence of disease, psychological well-being, life satisfaction, financial security, and having a positive perspective on life. Through activating a successful ageing process, it is aimed to minimise the biological, sociocultural, economic, and psychological losses and damages of the elderly individual⁶⁻⁸.

In the literature review conducted, a limited number of studies that examined the relationship between diabetes burden in elderly individuals with type 2 diabetes and successful ageing were accessed⁹⁻¹². It is believed that determining the diabetes burden in elderly individuals along with successful ageing, which defines how well an individual ages, will significantly contribute to coping with the disease and diabetes management. Besides, measuring diabetes burden and successful ageing levels in order to apply effective nursing care for elderly individuals with diabetes, increase patient satisfaction, and therefore reduce healthcare expenses will benefit the planning of diabetes treatment and care as well as the development of successful ageing policies for countries. Hence, the present study aimed to examine the relationship between diabetes burden in elderly individuals with type 2 diabetes and successful ageing.

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METHODS

Study design and participants

This descriptive study was conducted with the participation of elderly patients diagnosed with type 2 diabetes in the diabetes polyclinic of a research and training hospital between January and June 2021. An average of 200 elderly diabetes patients visit the diabetes polyclinic, and accepting this number as the population of the study, the minimum sample size was calculated as 520 with a 95% confidence interval and $\pm 5\%$ sampling error. The inclusion criteria were determined as follows: (a) being voluntary to participate in the study and aged 65 years and above, (b) having been followed up with the diagnosis of type 2 diabetes for at least 6 months, (c) not having a medium or advanced level of dementia, and (d) being able to communicate verbally. In line with these criteria, the study sample consisted of 526 elderly individuals. The data were collected through face-to-face interviews with the patients who agreed to participate in the study.

Data collection tools

The Patient Information Form: This form consisted of 15 questions about the individual sociodemographic and disease characteristics of the elderly. The patient's weight and height values were obtained from the last measurements, and HbA1c values were retrieved from patient files that included the results of the last laboratory tests.

Elderly Diabetes Burden Scale (EDBS): The 23-item Likert-type scale developed by Araki and Ito in Japan in 2003 to measure the burden of diabetes in elderly diabetic patients consists of six subscales. Usta and Esen conducted the Turkish validity and reliability tests of the scale (Cronbach's alpha: 0.92). The total scale score ranges between 18 and 88, and an increase in the scale score indicates an increase in the burden in that area, while a decrease points to a decrease in the burden in that area^{13,14}. The Cronbach's alpha coefficient of the scale was determined as 0.90 in the present study.

Successful Ageing Scale (SAS): The scale developed by Reker consists of 13 questions and two subscales¹⁵. The scale's validity and reliability study in Turkish was conducted by Hazer and Ozsungur (Cronbach's alpha: 0.85). The Turkish version of the scale consists of 10 questions and two subscales. The minimum and maximum scores to be obtained from the scale are 10 and 70, respectively; as the score increases, successful ageing status increases as well¹⁶. In the present study, Cronbach's alpha coefficient was 0.82.

Statistical analysis

The study's data were evaluated using SPSS 22.0 (IBM, Armonk, NY, USA) software. The measures of skewness and kurtosis were utilised to test whether the scores obtained from the measures were normally distributed, and in this regard, the acceptable range was set as (-1, +1). In the analysis of the data, descriptive statistics, Pearson correlation analysis, one-way analysis of variance (ANOVA), and Student's t-test were used. The results were evaluated at a 95% confidence interval, and the significance level was set at $p < 0.05$.

Ethical considerations

The study was conducted with the ethics committee's approval (date: 08.12.2020; decision no.: E.42680) and in line with the principles of the Declaration of Helsinki. All participants included in the study were verbally informed about the purpose and procedures of the study. After written consent was taken from each participant, the data collection process was completed.

RESULTS

Of participants aged 65–74 years, 50.8% were male; the average body mass index (BMI) was calculated as 28.71 ± 6.90 kg/m², and their HbA1c average value was found to be 9.92 ± 1.11 . The EDBS total mean score was 69.69 ± 5.27 , while the SAS score was 37.53 ± 3.01 (Table 1).

Accordingly, it was determined that the SAS total scores were found to be statistically significantly higher in females compared to males, in those who had been diagnosed with

Table 1. Mean score of Elderly Diabetes Burden Scale and Successful Ageing Scale (n=526).

Scale and subscale	Mean \pm SD	Min-max
EDBS total score	69.69 \pm 5.27	26.00–84.00
Burden of symptoms	13.90 \pm 4.38	0.00–16.00
Social burden	15.43 \pm 1.87	5.00–20.00
Burden of dietary restrictions	14.14 \pm 1.42	8.00–16.00
Burden related to the worry about diabetes	13.46 \pm 1.19	8.00–16.00
Burden of therapy dissatisfaction	4.61 \pm 0.72	2.00–6.00
Burden related to oral antidiabetics and insulin	8.12 \pm 1.10	3.00–12.00
SAS total score	37.53 \pm 3.01	26.00–70.00
Healthy lifestyle	10.80 \pm 1.37	5.00–21.00
Layout	26.72 \pm 2.16	16.00–49.00

SD: standard deviation; min-max: minimum-maximum.

diabetes with a duration of 6–15 years compared to those diagnosed with a duration of 16 years and above ($p<0.01$), in those who had regular diabetes check-ups compared to those who did not ($p<0.01$), and in those who had easy access to health services compared to those who had partial access to health services ($p<0.01$) (Table 2).

The EDBS total scores were determined to be statistically significantly higher in males compared to females, in those who had insulin as a therapy type compared to those who had

oral antidiabetic drug (OAD) and insulin, and in those whose perceived health status was poor compared to those whose perceived health status was moderate and good ($p<0.05$). It was also concluded that the EDBS Scale total score of those who had diabetes check-ups was statistically significantly higher in comparison to those who sometimes had diabetes check-ups ($p<0.01$) (Table 2).

A negative and significant relationship was found between the subscales of Burden of Dietary Restrictions and Burden

Table 2. Comparison of descriptive and diabetes-related characteristics of elderly individuals with the Elderly Diabetes Burden scale and Successful Aging Scale total scores (n=526).

Descriptive	n	%	EDBS		SAS	
			Mean±SD	Statistical analysis	Mean±SD	Statistical analysis
Age (year)						
65–74	410	77.9	69.60±5.37	t: -0.718	37.42±3.01	t: -1.522
≥75	116	22.1	70.01±4.92	p: 0.473	37.90±2.97	p: 0.129
Gender						
Female	259	49.2	69.14±5.13	t: -2.385	38.11±2.68	t: 4.475
Male	267	50.8	70.23±5.36	p: 0.017	36.96±3.19	p: 0.000
Education						
Literate	73	13.9	70.17±5.06	F: 2.306	37.50±3.24	F: 0.924
Elementary school	282	53.6	70.04±5.16	p: 0.057	37.70±2.94	p: 0.450
Middle school	150	28.5	69.10±5.47		37.19±3.07	
High school	21	4.0	68.01±5.19		37.75±2.35	
Perceived income status						
Good	32	6.1	70.78±5.35	F: 1.247	36.68±2.65	F: 1.889
Moderate	455	86.5	69.55±5.30	p: 0.288	37.62±3.03	p: 0.152
Not good	39	7.4	70.46±4.88		37.10±2.82	
Duration of diabetes diagnosis (year)						
6–10	28	5.3	70.57±4.34	F: 3.515	39.21±3.19 ^c	F: 27.859
11–15	79	15	71.00±4.89 ^a	p: 0.030	39.43±3.14 ^d	p: 0.000
16 and over	419	79.7	69.39±5.37^b		37.06±2.79 ^e	
Diabetes treatment method						
OAD and insulin	448	85.2	69.59±5.24	t: 0.446	37.35±2.94	t: 0.040
Insulin	78	14.8	70.33±5.50	p: 0.002	38.56±3.17	p: 0.250
Regular diabetes control						
Yes	110	20.9	73.25±3.65	F: 9.897	38.30±2.90	F: 9.478
No	115	21.9	69.41±5.43	p: 0.000	37.02±3.58	p: 0.000
Partially	301	57.2	69.40±5.20		37.13±2.90	
Easy access to healthcare						
Yes	39	7.4	69.20±4.58	F: 2.832	39.17±2.70	F: 30.451
No	205	39	70.38±5.76	p: 0.060	36.36±3.17	p: 0.000
Partially	282	53.6	69.26±4.95		38.15±2.61	

F: one-way ANOVA test; t: t-test. Duration of diabetes diagnosis: between a–b, c–e, and between d–e. Bold values indicate statistical significance at the $p<0.05$ level.

Related to Oral Antidiabetics and Insulin and the SAS total score. In contrast, a positive, strong, and significant relationship was determined between the subscales of Burden Related to the Worry About Diabetes and Burden of Therapy Dissatisfaction and the SAS total score ($p < 0.01$). No significant relationship was found between the EDBS total score and the SAS total score ($p > 0.05$). In addition, it was determined that there was a positive and strong correlation between BMI and the EDBS subscale of Burden of Dietary Restrictions ($p < 0.01$). Moreover, a negative and statistically significant relationship was found between the number of complications and the Burden of Therapy Dissatisfaction subscale score. In contrast, a positive and statistically significant correlation was determined between the Burden of Dietary Restrictions subscale score and the EDBS total score (Table 3).

DISCUSSION

In the present study, it was determined that, among the socio-demographic characteristics, being a women was an important factor in terms of successful ageing. Similar results have been obtained in studies conducted on the elderly population, which showed that females aged more successfully^{5,10,17,18}. A study demonstrated that females had a more positive attitude towards life¹¹, and another study found that the rate of successful ageing was higher in females¹⁰. However, a study showed that gender has no effect on successful ageing¹².

As the duration of diabetes becomes longer, the rate of chronic complications developing in relation to diabetes increases¹⁹. These complications affect the individual physically and psychologically and lead to disabilities. In the present study, it was observed that the patients with shorter duration of diabetes diagnosis had better successful ageing rates and also higher care burden. It was thought that this could be

because the development of diabetes-related chronic complications was less likely in patients with a shorter duration of a diabetes diagnosis.

According to the study's findings, elderly diabetic individuals who had regular diabetes check-ups and easy access to health services aged successfully. Successful ageing was generally studied in studies conducted as the absence of chronic diseases, absence of disabilities, good level of cognitive functions, and active life^{3,10,20}. Individuals having regular check-ups and keeping their diabetes under control to maintain their health levels can be considered successful ageing²⁰. This could be because these individuals have good cognitive functions, can meet their physical needs themselves, have their health checked to maintain their current health level, and have easy access to health services. Preventive health applications must be available, and individuals should be able to use them for successful ageing¹⁸.

In the present study, it was determined that males had a higher diabetes burden. Diabetes burden can be higher in males compared to females as they experience comorbid diseases more intensely, have a lack of knowledge of diseases, have less awareness compared to females, and have deficiencies in managing diabetes on their own, and they cannot manage self-care. It is thought that future studies to be conducted on the relationship between gender and diabetes burden can contribute to the present study in terms of significance.

The primary principle in treating T2DM is nutrition and OAD. It is estimated in studies conducted that individuals with T2DM would become insulin dependent in 10 years following the diagnosis⁴. Administering insulin as an injection, especially in intense insulin therapies, brings heavier burdens and responsibilities for elderly individuals regarding both skill and adaptation. In the present study, the care burden of insulin patients was higher. Another study result showed that as the burden of the patient increased in relation to the medications used in diabetes therapy, their successful ageing was negatively affected²¹.

Table 3. Relationship between Diabetes Burden Scale, Successful Aging Scale and descriptive variables (n=526).

EDBS	SAS			Age	HbA1c	BMI (kg/m ²)	Number of complications
	Healthy lifestyle	Layout	Total score				
Burden of symptoms	0.040	0.034	0.043	0.057	0.001	0.016	0.218**
Social burden	0.007	0.042	0.033	0.005	0.040	0.044	0.022
Burden of dietary restrictions	-0.418**	0.006	-0.187**	0.026	0.081	0.111*	0.484**
Burden related to the worry about diabetes	0.391**	0.296**	0.392**	0.056	0.025	-0.061	0.021
Burden of therapy dissatisfaction	0.284**	0.149**	0.237**	0.036	0.027	-0.023	-0.259**
Burden related to oral antidiabetics and insulin	-0.132**	-0.153**	-0.170**	0.003	0.072	-0.010	0.081
Total score	0.022	0.100*	0.082	0.075	0.061	0.040	0.305**

Pearson correlation test. * $p < 0.05$; ** $p < 0.001$. Bold values indicate statistical significance at the $p < 0.05$ level.

The number of chronic cases the patients have and their little knowledge about the therapy are related to the care burden²². The present study determined that as the number of complications increased, the burden of diabetes also increased. Along with the increased complications, the number of patients presenting to the hospital for examination for the follow-up of these complications also increases²³. In the current study, it was found that patients who had regular check-ups had a higher care burden. Besides having regular check-ups at the hospital, visiting the hospital for the follow-up of complications, or an increase in hospitalisation can bring a physical burden to the patients.

Obesity is a common comorbidity of diabetes²¹. In the study, the burden of dietary restriction is increased in people who do not age successfully, do not have healthy lifestyle behaviours, and have a high BMI. It is also known that regular physical activity, diet, and healthy lifestyle habits are highly effective in treating T2DM in terms of ensuring weight and metabolic control and preventing potential complications^{7,24}. In addition, cardiovascular risks are associated with high BMI in metabolic disorders⁷. It is thought that getting diabetic individuals to gain healthy lifestyle habits, especially starting at an early age, and preventing obesity will ensure successful ageing^{8,24}.

In the present study, it was determined that as the diabetic patients' burden regarding their worries about diabetes and their dissatisfaction with the therapy increased, their successful ageing rate also increased. An increase in the diabetes burden in diabetic patients can help them struggle against problems in their successful ageing. The comorbidity of ageing and diabetes necessitates diabetic patients to develop new coping strategies and adopt lifestyle changes such as dietary restrictions,

monitoring their blood sugar, exercise, and drug management. In published studies, successful ageing was mainly examined in the context of the absence of chronic disease and the ability to sustain physical activity. Nevertheless, elderly adults can consider their ageing successful even in the presence of a disease or a disability^{17,25,26}.

CONCLUSION

In the present study, it was determined that elderly type 2 diabetic patients who did not have regular check-ups and who could not access health services easily had low successful ageing scores and that those whose treatment type was insulin, who had poor perceived health status, and whose number of complications was high had more care burden. In this context, ensuring free and easy access to health services for the elderly, diagnosing diabetes at an early stage, planning suitable nutrition, exercise, and drug therapy for the individual, preventing complications, taking necessary precautions in time, and providing elderly care services in this regard will help reduce the diabetes burden and increase successful ageing.

AUTHORS' CONTRIBUTIONS

SC: Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **EB:** Conceptualization, Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. **MK:** Conceptualization, Formal Analysis, Writing – review & editing. **GA:** Data curation, Writing – review & editing.

REFERENCES

- World Population Ageing 2013. United Nations, Department of Economic and Social Affairs, Population Division. ST/ESA/SER.A/348.
- IDF Diabetes Atlas. 10th ed. International Diabetes Federation. Published 2021. <https://diabetesatlas.org>
- Sorpreso IC, Soares Júnior JM, Fonseca AM, Baracat EC. Female ageing. *Rev Assoc Med Bras* (1992). 2015;61(6):553-6. <https://doi.org/10.1590/1806-9282.61.06.553>
- Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, Dincçag N, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol*. 2013;28(2):169-80. <https://doi.org/10.1007/s10654-013-9771-5>
- Bosnes I, Nordahl HM, Stordal E, Bosnes O, Myklebust TÅ, Almkvist O. Lifestyle predictors of successful aging: a 20-year prospective HUNT study. *PLoS One*. 2019;14(7):e0219200. <https://doi.org/10.1371/journal.pone.0219200>
- Urtamo A, Jyväkorpi SK, Strandberg TE. Definitions of successful ageing: a brief review of a multidimensional concept. *Acta Biomed*. 2019;90(2):359-63. <https://doi.org/10.23750/abm.v90i2.8376>
- Bagnoli VR, Fonseca AM, Arie WM, Das Neves EM, Azevedo RS, Sorpreso IC, et al. Metabolic disorder and obesity in 5027 Brazilian postmenopausal women. *Gynecol Endocrinol*. 2014;30(10):717-20. <https://doi.org/10.3109/09513590.2014.925869>
- Bagnoli VR, Fonseca AMD, Massabki JOP, Arie WMY, Azevedo RS, Veiga ECA, et al. Gynecological cancer and metabolic screening of 1001 elderly Brazilian women. *Rev Assoc Med Bras* (1992). 2019;65(10):1275-82. <https://doi.org/10.1590/1806-9282.65.10.1275>
- Ovayolu Ö, Ovayolu N, Doğru A, Özkaya M. The challenge of diabetes in the elderly and affecting factors: a Turkish study. *Holist Nurs Pract*. 2015;29(5):272-9. <https://doi.org/10.1097/HNP.000000000000102>
- Ng TP, Broekman BF, Niti M, Gwee X, Kua EH. Determinants of successful aging using a multidimensional definition among Chinese elderly in Singapore. *Am J Geriatr Psychiatry*. 2009;17(5):407-16. <https://doi.org/10.1097/JGP.0b013e31819a808e>
- Eloranta S, Arve S, Lavonius S, Routasalo P, Lehtonen A, Viitanen M, et al. Positive life orientation in old age: a 15-year follow-up. *Arch Gerontol Geriatr*. 2012;55(3):586-91. <https://doi.org/10.1016/j.archger.2012.04.010>

12. Yalcinoz Baysal H, Aktas B, Bakan AB. An investigation of the relationship between ageing in place and successful ageing in elderly individuals. *Psychogeriatrics*. 2020;20(4):473-9. <https://doi.org/10.1111/psyg.12534>
13. Araki A, Ito H. Development of elderly diabetes burden scale for elderly patients with diabetes mellitus. *Geriatr Gerontol Int*. 2003;3(4):212-24. <https://doi.org/10.1111/j.1444-1586.2003.00084.x>
14. Usta YY, Esen A. A study of the validity and reliability of the "Elderly Diabetes Burden Scale" for the Turkish society. *Turkish J Geriatr Geriatr Derg*. 2012;15(1):61-7.
15. Reker GT. A brief manual of the Successful Aging Scale (SAS). DOI. 2009;10(2.1):4238-720.
16. Özsungur F, Hazer O. Başarılı Yaşlanma Ölçeği (BYÖ) Türkçe Versiyonu. *Int J Educ Technol Sci Res*. 2017;2(4):184-206.
17. Silva-Sauer L, Martins-Rodrigues R, Torre-Luque A, Fernández-Calvo B. Cross-cultural adaptation and psychometric properties of the Brazilian Portuguese version of successful aging scale in community-dwelling older adults. *J Community Psychol*. 2020;48(6):1840-52. <https://doi.org/10.1002/jcop.22374>
18. Bosnes I, Almkvist O, Bosnes O, Stordal E, Romild U, Nordahl HM. Prevalence and correlates of successful aging in a population-based sample of older adults: the HUNT study. *Int Psychogeriatr*. 2017;29(3):431-40. <https://doi.org/10.1017/S1041610216001861>
19. Lin X, Xu Y, Pan X, Xu J, Ding Y, Sun X, et al. Global, regional, and national burden and trend of diabetes in 195 countries and territories: an analysis from 1990 to 2025. *Sci Rep*. 2020;10(1):14790. <https://doi.org/10.1038/s41598-020-71908-9>
20. Nakagawa T, Cho J, Yeung DY. Successful aging in east Asia: Comparison among China, Korea, and Japan. *J Gerontol B Psychol Sci Soc Sci*. 2021;76(Suppl 1):S17-26. <https://doi.org/10.1093/geronb/gbaa042>
21. Cannon A, Handelsman Y, Heile M, Shannon M. Burden of illness in type 2 diabetes mellitus. *J Manag Care Spec Pharm*. 2018;24(9-a Suppl):S5-13. <https://doi.org/10.18553/jmcp.2018.24.9-a.s5>
22. Spencer-Bonilla G, Quiñones AR, Montori VM; International Minimally Disruptive Medicine Workgroup. Assessing the burden of treatment. *J Gen Intern Med*. 2017;32(10):1141-5. <https://doi.org/10.1007/s11606-017-4117-8>
23. Akyol Güner T, Bayraktaroglu T, Seval M. Yaşlı Tip 2 Diyabetli Bireylerde Diyabet Yükünün İncelenmesi: Zonguldak İli Örneği. *Turkish J Diabetes Obes*. 2020;4(2):108-18. <https://doi.org/10.25048/tudod.723725>
24. Sayyed Kassem L, Aron DC. The assessment and management of quality of life of older adults with diabetes mellitus. *Expert Rev Endocrinol Metab*. 2020;15(2):71-81. <https://doi.org/10.1080/17446651.2020.1737520>
25. Lu W, Pikhart H, Sacker A. Domains and measurements of healthy aging in epidemiological studies: a review. *Gerontologist*. 2019;59(4):e294-310. <https://doi.org/10.1093/geront/gny029>
26. Muneera K, Muhammad T, Althaf S. Socio-demographic and lifestyle factors associated with intrinsic capacity among older adults: evidence from India. *BMC Geriatr*. 2022;22(1):851. <https://doi.org/10.1186/s12877-022-03558-7>

