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Exploring the relationship between glycated haemoglobin levels and geriatric syndromes in elderly patients with diabetes (a cross-sectional study)

Badanie związku między poziomami hemoglobiny glikowanej a zespołami geriatrycznymi u starszych pacjentów z cukrzycą (badanie przekrojowe)

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Abstract

Background. One common chronic condition is diabetes mellitus (DM), which is more prevalent in the elderly and is often linked to a variety of issues and concomitant conditions. Geriatric symptoms, such as depression, weakness, tiredness, and insomnia, are known to impact health outcomes in this demographic significantly.

Objective. This study investigated the connection between glycated hemoglobin (HbA1c) levels and geriatric symptoms in seniors with diabetes.

Methods. An appropriate sample of fifty senior people (60–85 years old) with diabetes mellitus was selected from the outpatient ward of Saveetha Hospital. The HbA1c values were assessed in addition to examinations for geriatric symptoms using established measures. Potential correlations between HbA1c levels and geriatric syndromes were examined by statistical analysis.

Results. The following variables showed significant positive relationships with HbA1c levels: frailty ($r = 0.571$, $p < 0.000$), fatigue ($r = 0.725$, $p < 0.000$), sleeplessness ($r = 0.631$, $p < 0.000$), and geriatric depression ($r = 0.529$, $p < 0.000$).

Conclusion. In older diabetes mellitus patients, higher HbA1c levels were linked to a higher prevalence of fatigue, insomnia, frailty, and depression. These results emphasize the need for glycemic control in treating geriatric diseases in this population.

Key words

diabetes mellitus, geriatric syndromes, glycated hemoglobin, depression, frailty, fatigue, insomnia, elderly patients

Streszczenie

Wstęp. Jedną z powszechnych przewlekłych chorób jest cukrzyca (DM), która częściej występuje u osób starszych i często wiąże się z różnorodnymi problemami i chorobami współistniejącymi. Objawy geriatryczne, takie jak depresja, osłabienie, zmęczenie i bezsenność, znacząco wpływają na wyniki zdrowotne tej grupy demograficznej.

Cel. Badanie to badało związek między poziomami hemoglobiny glikowanej (HbA1c) a objawami geriatrycznymi u seniorów z cukrzycą.

Metody. Wybrano odpowiednią próbkę pięćdziesięciu seniorów (w wieku 60–85 lat) z cukrzycą z ambulatorium Szpitala Saveetha. Oceniano wartości HbA1c oraz przeprowadzono badania objawów geriatrycznych przy użyciu uznanych metod. Możliwe korelacje między poziomami HbA1c a zespołami geriatrycznymi badano za pomocą analizy statystycznej.

Wyniki: Następujące zmienne wykazały znaczące dodatnie związki z poziomami HbA1c: słabość ($r = 0.571$, $p < 0.000$), zmęczenie ($r = 0.725$, $p < 0.000$), bezsenność ($r = 0.631$, $p < 0.000$) oraz depresja geriatryczna ($r = 0.529$, $p < 0.000$).

Wnioski. U starszych pacjentów z cukrzycą wyższe poziomy HbA1c były związane z wyższym występowaniem zmęczenia, bezsenności, słabości i depresji. Wyniki te podkreślają potrzebę kontroli glikemii w leczeniu chorób geriatrycznych w tej populacji.

Słowa kluczowe

cukrzyca, zespoły geriatryczne, hemoglobina glikowana, depresja, słabość, zmęczenie, bezsenność, starsi pacjenci

Introduction

Diabetes mellitus (DM) is a chronic metabolic condition characterized by persistent hyperglycemia resulting from impaired metabolism of proteins, fats, and carbohydrates, often linked to insufficient insulin secretion or reduced insulin sensitivity [1]. Various classifications of diabetes, including gestational diabetes, type 1, and type 2 diabetes, differ in diagnostic criteria, underlying etiology, and genetic predisposition [2]. Type 1 diabetes (T1DM), accounting for about 5% of all diabetes cases, is marked by insulin deficiency and is typically managed with short-acting, long-acting, or intermediate-acting exogenous insulin formulations [3]. T1DM, also known as autoimmune diabetes, results from the destruction of pancreatic β -cells, leading to hyperglycemia, with symptoms typically emerging in childhood or adolescence, though they can appear later [4]. Type 2 diabetes (T2DM) is a significant global health issue, particularly affecting older adults, and requires ongoing patient care to minimize acute and chronic complications [5]. In developed countries, diabetes prevalence is higher among those aged 65 and older [6]. In Canada, type 2 diabetes is more common in older adults (14% to 23%) compared to the US (8.5%) [7]. T2DM adversely affects organ function, including cardiovascular, renal, and nervous systems, exacerbating age-related decline [8]. Factors such as rising obesity rates, increased inactivity, and an aging population contribute to the growing incidence of diabetes [9]. Research indicates that 40% of older adults with diabetes have at least two co-morbidities, and 40–50% have three or more [10, 11]. This population is particularly vulnerable to frailty and sarcopenia due to diabetes-related effects like increased fat storage and insulin resistance [12]. Long-term consequences of T2DM include deteriorating mental health and quality of life, with older diabetic individuals being three times more likely than their non-diabetic counterparts to experience depressive symptoms and fatigue [13]. Depression leads to reduced quality of life, diminished working capacity, and worsened symptoms of pre-existing conditions [14]. While the etiology of depression is complex, it is associated with genetics, illnesses, social isolation, disability, psychosocial stressors, and changes in brain chemistry, all of which are more prevalent in older adults [15, 16]. Fatigue, a state of psychological and physical exhaustion, can significantly impact daily activities and is often experienced by patients with depression [17, 18]. In older adults (65+), depression is linked to increased suicide risk, morbidity, higher medical costs, and physical and emotional suffering [19]. Factors such as blood sugar variability, medication side effects, anxiety about self-management, and complications can exacerbate fatigue and complicate diabetes management. The 10-item Scale as-

sesses chronic fatigue symptoms, viewing exhaustion as a single cause without breaking it down into distinct elements while ensuring all facets of exhaustion are represented [20]. A seven-item survey screens for insomnia, focusing on subjective sleep aspects and distress levels [21]. Depression is not a natural part of aging; early identification and treatment can lead to recovery. Untreated depression can result in a lower quality of life, prolonged recovery from illness or surgery, increased medical needs, and even suicide, affecting the social, cognitive, functional, and physical domains of health. The Short Form GDS, created in 1986, consists of 15 questions derived from the long-form GDS that correlate strongly with depressive symptoms [22]. The CFS, developed in 2005 and used in over 20 countries, assesses frailty in older adults, linking health issues to functional impact. It is based on the Frailty Index from the Canadian Study of Health and employs a nine-point rating system to evaluate mobility, energy, physical activity, and function [23].

Methods

Study Design and Setting

A cross-sectional study was conducted over 18 weeks in the outpatient ward at a private hospital.

Population and Sampling

Fifty diabetic patients aged 60–85 with HbA1c levels > 6.5% were selected through convenience sampling. Exclusion criteria included recent trauma, degenerative or inflammatory diseases, severe pulmonary conditions, history of orthopedic surgery, or diagnosed mental disorders.

Data Collection and Analysis

Participants provided informed consent and were assessed using the FAS, ISI, GDS, and CFS. HbA1c levels were extracted from medical records. Data normality was tested using the Shapiro-Wilk test, and statistical analyses were performed using IBM SPSS version 26.

Results

Significant positive correlations were observed between HbA1c levels and all clinical assessments:

- FAS ($p = 0.000$, $r = 0.725$).
- ISI ($p = 0.000$, $r = 0.639$).
- GDS ($p = 0.000$, $r = 0.529$).
- CFS ($p = 0.000$, $r = 0.571$).

These findings indicate that poor glycemic control is strongly associated with fatigue, sleep disturbances, depression, and frailty.

A significant positive correlation was identified between the Fatigue

Table 1. Demographic characteristics of the participants

Variable	N	Mean	STD.Deviation
AGE			
60-64	23		
65-69	18	66.3	5.421
70-75	5		
Above 75	4		
GENDER			
Male	25	1.50	0.505
Female	25		

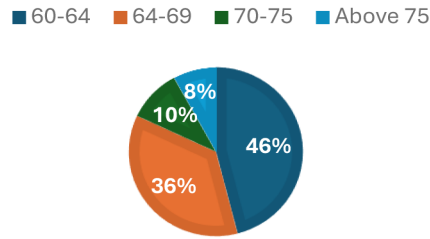


Figure 1. Age group-wise presentation

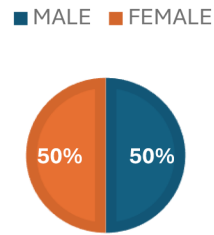


Figure 2. Diabetes patients by gender

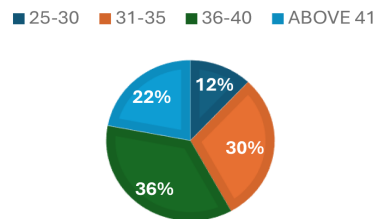


Figure 3. Grading of Fatigue Assessment Scale (FAS)

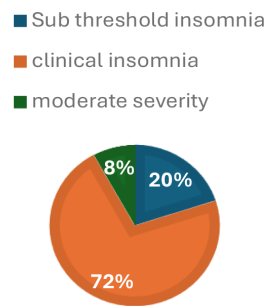


Figure 4. Grading of insomnia severity index

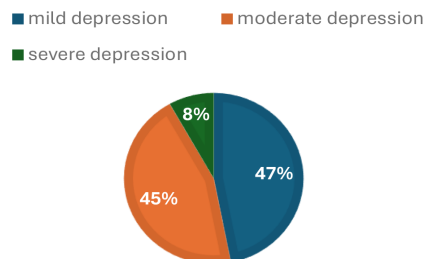


Figure 5. Grading of Geriatric Depression Scale

■ Fit/Mild Frailty CFS ■ Moderate Frailty
■ Severe Frailty

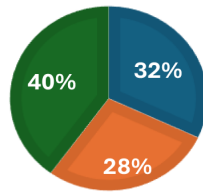


Figure 6. Grading of Clinical Frailty Scale

Table 2. Relationship between HbA1c Test And Fatigue Assessment Scale (FAS)

Variable	N	R	P Value
Assessment Scale (FAS)	50	0.725	0.000

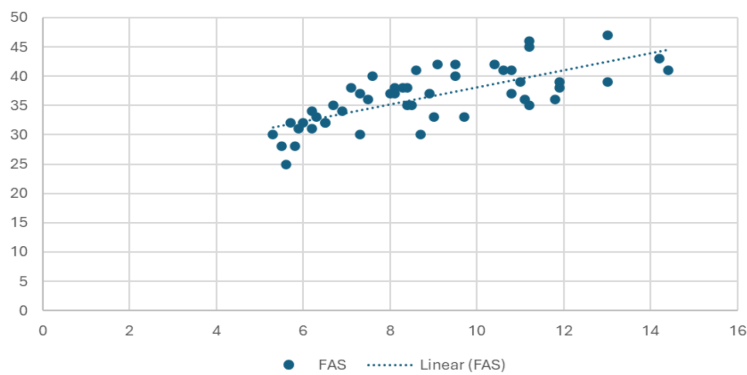


Figure 7. Graph representing the correlation between HbA1c and fatigue assessment scale

Assessment Scale (FAS) and HbA1c findings ($p = 0.000$, $r = 0.725$).

Table 3. Relationship between HbA1c Test and Insomnia Severity Index

Variable	N	R	P Value
Insomnia Severity Index	50	0.631	0.000

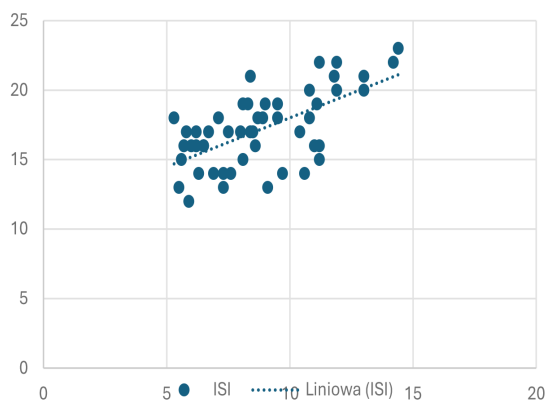


Figure 8. Graph representing the correlation between the HbA1c test and insomnia severity index

The Insomnia Severity Index and HbA1c test show a significant positive correlation ($p = 0.000$, $r = 0.631$).

Table 4. Relationship between HbA1c Test and Geriatric Depression Scale

Variable	N	R	P Value
Geriatric Depression scale	50	0.529	0.000

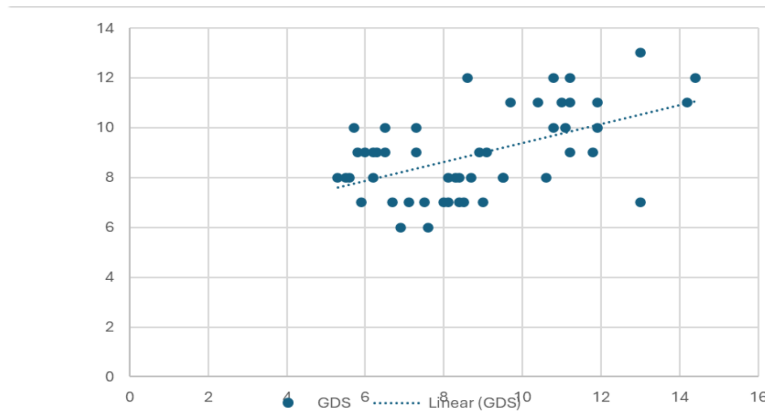


Figure 9. Graph representing the correlation between the HbA1c test and geriatric depression scale

The data indicates a high positive connection ($p = 0.000$ and $r = 0.529$) between the HbA1c test and the Geriatric Depression scale.

Table 5. Relationship between HbA1c Test and Clinical Frailty Scale

Variable	N	R	P Value
Clinical Frailty scale	50	0.571	< 0.000

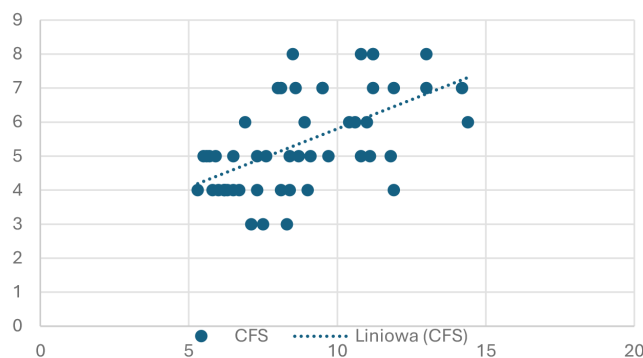


Figure 10. Graph representing the correlation between the HbA1c test and the clinical frailty scale

The HbA1c test and the Clinical frailty scale have a substantial positive connection, with a 0.000 significant p-value and an r-value of 0.571.

Therefore, the results indicate that elevated HbA1c levels are strongly associated with fatigue, insomnia, frailty, and depression, contributing to their high incidence in people with diabetes mellitus.

Discussion

Diabetes mellitus (DM) complications extend beyond metabolic issues, contributing to symptoms such as fatigue, insomnia, depression, and frailty. This study confirms significant correlations between HbA1c levels and these symptoms, emphasizing

the systemic impact of poor glycemic control. Our results align with previous studies. Gorska-Ciebiada et al. [24] showed that depressive symptoms and mild cognitive impairment are common in elderly diabetic patients, which further complicates management and care. Bai et al. [25] demonstrated that depressive symptoms are closely linked to age and the severity of diabetes in elderly individuals, reinforcing the need for targeted interventions. Aylaz et al. [26] noted that loneliness heightens vulnerability to fatigue and depression, particularly for patients living alone. Additionally, Vu et al. [27] found that depression severity increases with diabetes duration, consistent with our findings. Darwish et al. [28] reported that HbA1c > 7% correlates with increased fatigue, depres-

sion, and sleep disturbances. Brod et al. [29] discussed barriers to insulin initiation in type 2 diabetes patients, revealing misconceptions and clinical realities that hinder proper management, which can indirectly exacerbate psychosocial issues such as fatigue and depression. Lien et al. [30] highlighted psychological factors, such as depression, mediating the link between poor glucose control and sleep disorders. Ganidagli and Ozturk [31] identified poor sleep quality as a factor exacerbating frailty among elderly diabetics. Mechanisms underlying these associations include chronic hyperglycemia-induced inflammation, which contributes to fatigue, depression, and sleep disruption. Diabetes-related nerve damage and microvascular complications impair motor function and quality of life, leading to frailty and psychological distress. Hyperglycemia alters cortisol levels via dysregulation of the hypothalamic-pituitary-adrenal axis, exacerbating systemic inflammation and intensifying symptoms of fatigue and depression. This underscores the importance of addressing metabolic and psychosocial aspects of diabetes management. Diabetes care must extend beyond glycemic control to include routine assessments of fatigue, depression, insomnia, and frailty. Interventions such as cognitive behavioral therapy (CBT) for insomnia or depression can complement traditional treatments. Community-based programs and social support sys-

tems may mitigate the psychosocial burden, particularly for elderly living alone. However, small sample sizes limiting generalizability, convenience sampling introducing potential bias, and reliance on self-reported data were considered limitations.

Conclusion

This study highlights the prevalence of fatigue, insomnia, frailty, and depression in elderly diabetic patients and their strong association with poor glycemic control. FAS, ISI, GDS, and CFS are practical tools for assessing these symptoms. Significant positive correlations between HbA1c levels and these metrics ($p = 0.000$, $r = 0.725, 0.639, 0.529, 0.571$) underscore the need for integrated care. Addressing psychosocial factors alongside metabolic management can improve treatment compliance, disrupt the cycle of poor health outcomes, and enhance quality of life.

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Piśmiennictwo/ References

1. Alam U, Asghar O, Azmi S, Malik RA. General aspects of diabetes mellitus. In: Handbook of clinical neurology. 2014;126:211-22.
2. Katsarou A, Gudbjörnsdóttir S, Rawshani A, Dabelea D, Bonifacio E, Anderson BJ, Jacobsen LM, Schatz DA, Lernmark Å. Type 1 diabetes mellitus. Nat Rev Dis Primers. 2017 Mar 30;3(1):1-7.
3. Cooke DW, Plotnick L. Type 1 diabetes mellitus in pediatrics. Pediatrics in Review. 2008 Nov;29(11):374-85.
4. SEARCH Study Group. SEARCH for Diabetes in Youth: a multicenter study of the prevalence, incidence, and classification of diabetes mellitus in youth. Controlled Clin Trials. 2004 Oct;25(5):458-71.
5. Yamada K, Yamaguchi S, Ito YM, Ohe T. Factors associated with mobility decrease leading to disability: a cross-sectional nationwide study in Japan, with results from 8681 adults aged 20-89 years. BMC Geriatr. 2021 Dec;21(1):1-0.
6. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. Diabetes Care. 1998 Sep;21(9):1414-31.
7. Sabapathy S, Neslusan C, Yoong K, Teschemaker A, Johansen P, Willis M. Cost-effectiveness of canagliflozin versus sitagliptin when added to metformin and sulfonylurea in type 2 diabetes in Canada. J Popul Ther Clin Pharmacol. 2016;23(2).
8. International Diabetes Federation. IDF Diabetes Atlas, 6th ed. Brussels, Belgium: International Diabetes Federation; 2013.
9. O'Shea M, Teeling M, Bennett K. The prevalence and ingredient cost of chronic comorbidity in the Irish elderly population with medication treated type 2 diabetes: a retrospective cross-sectional study using a national pharmacy claims database. BMC Health Serv Res. 2013 Dec;13(1):1-0.
10. Maddigan SL, Feeny DH, Johnson JA. Health-related quality of life deficits associated with diabetes and comorbidities in a Canadian National Population Health Survey. Qual Life Res. 2005 Jun;14:1311-20.

11. Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in older people. *Arch Intern Med.* 2002 Nov 11;162(20):2269-76.
12. Malmstrom TK, Rodriguez-Mañas L, Sinclair AJ. Frailty, Sarcopenia and Diabetes. *J Am Med Dir Assoc.* 2014;15:853-9.
13. Moreh E, Jacobs JM, Stessman J. Fatigue, function, and mortality in older adults. *J Gerontol A Biol Sci Med Sci.* 2010 Aug;65(8):887-95.
14. Judd LL, Akiskal HS, Zeller PJ, Paulus M, Leon AC, Maser JD, Endicott J, Coryell W, Kunovac JL, Mueller TI, Rice JP. Psychosocial disability during the long-term course of unipolar major depressive disorder. *Arch Gen Psychiatry.* 2000 Apr;57(4):375-80.
15. Blazer DG. Depression in late life: review and commentary. *J Gerontol A Biol Sci Med Sci.* 2003 Mar;58(3):M249-65.
16. Bruce ML. Psychosocial risk factors for depressive disorders in late life. *Biol Psychiatry.* 2002 Aug;52(3):175-84.
17. Davis MP, Walsh D. Mechanisms of fatigue. *J Support Oncol.* 2010 Jul;8(4):164-74.
18. Kalra S, Sahay R. Diabetes fatigue syndrome. *Diabetes Ther.* 2018 Aug;9:14219.
19. Charney DS, Reynolds CF, Lewis L, Lebowitz BD, Sunderland T, Alexopoulos GS, Blazer DG, Katz IR, Meyers BS, Arean PA, Borson S. Depression and Bipolar Support Alliance consensus statement on the unmet needs in diagnosis and treatment of mood disorders in late life. *Arch Gen Psychiatry.* 2003 Jul;60(7):664-72.
20. Michielsen HJ, De Vries J, Van Heck GL. Psychometric qualities of a brief self-rated fatigue measure: The Fatigue Assessment Scale. *J Psychosom Res.* 2003 Apr;54(4):345-52.
21. Manber R, Edinger JD, Gress JL, Pedro-Salcedo MG, Kuo TF, Kalista T. Cognitive behavioral therapy for insomnia enhances depression outcome in patients with comorbid major depressive disorder and insomnia. *Sleep.* 2008 Apr;31(4):489-95.
22. Greenberg SA. The Geriatric Depression Scale (GDS). *Best Pract Nurs Care Older Adults.* 2012 Nov 4;4(1):1-2.
23. Church S, Rogers E, Rockwood K, Theou O. A scoping review of the Clinical Frailty Scale. *BMC Geriatr.* 2020 Dec;20(1):1-8.
24. Gorska-Ciebiada M, Saryusz-Wolska M, Ciebiada M, Loba J. Mild cognitive impairment and depressive symptoms in elderly patients with diabetes: prevalence, risk factors, and comorbidity. *J Diabetes Res.* 2014 Oct;2014.
25. Bai YL, Chiou CP, Chang YY, Lam HC. Correlates of depression in type 2 diabetic elderly patients: a correlational study. *Int J Nurs Stud.* 2008 Apr;45(4):571-9.
26. Aylaz R, Karadağ E, Işık K, Yildirim M. Relationship between social support and fatigue in patients with type 2 diabetes mellitus in the east of Turkey. *Japan J Nurs Sci.* 2015 Oct;12(4):367-76.
27. Vu HT, Nguyen TX, Nguyen HT, Le TA, Nguyen TN, Nguyen AT, Nguyen TT, Nguyen HL, Nguyen CT, Tran BX, Latkin CA. Depressive symptoms among elderly diabetic patients in Vietnam. *Diabetes Metab Syndr Obes.* 2018 Oct 23;659-65.
28. Brod M, Alolga SL, Meneghini L. Barriers to initiating insulin in type 2 diabetes patients: developing a new patient education tool to address myths, misconceptions and clinical realities. *Patient Prefer Adherence.* 2014 Dec;7:437-50.
29. Darwish L, Beroncal E, Sison MV, Swardfager W. Depression in people with type 2 diabetes: current perspectives. *Diabetes Metab Syndr Obes.* 2018 Jul 10;11:333-343.
30. Lien, A.S., Jiang, Y., Tsai, J., Hwang, J., & Lin, W. (2020). Prediction of Diabetic Nephropathy from the Relationship between Fatigue, Sleep and Quality of Life. *Applied Sciences.*
31. Ganidagli S, Ozturk ZA. Poor sleep quality is an overlooked risk for geriatric syndromes in older adults with type 2 diabetes mellitus. *Postgrad Med.* 2023 Sep;135(7):717-726.