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Original Article

ASSESSMENT OF GLYCEMIC CONTROL RATES IN FRAIL OLDER ADULTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT: Diabetes mellitus is increasingly prevalent among older adults, and glycemic control remains challenging. According to the 2025 American Diabetes Association (ADA) recommendations, HbA1c targets should be individualized based on frailty, functional and cognitive status, life expectancy, comorbidities, and vascular complications. This study aimed to determine the proportion of older patients achieving glycemic control targets and to examine the associations between geriatric factors and treatment effectiveness in patients with type 2 diabetes mellitus. A descriptive cross-sectional study was conducted from April to August 2025 at the Endocrinology Outpatient Clinic, Thong Nhat Hospital, Ho Chi Minh City. Among 185 patients, the median age was 68 years (64–75.5), and 45.4% achieved their HbA1c target. Multivariable logistic regression showed that frailty and high cardiovascular risk were independently associated with the likelihood of achieving the HbA1c target, with OR = 0.48 (95% CI: 0.25–0.92; p = 0.027) and OR = 0.57 (95% CI: 0.32–0.99; p = 0.047), respectively. Multimorbidity and polypharmacy were not significantly associated with achieving the HbA1c target. The proportion of patients achieving their HbA1c target remained limited. Frailty and high cardiovascular risk were independently associated with the likelihood of achieving treatment targets.

Keywords: older adults, frailty, glycemic control

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1. INTRODUCTION

The proportion of older patients with diabetes mellitus (DM) has been increasing in recent years. As a result, clinicians, from general internists to endocrinologists, are seeing more and more patients in this specific population. According to the 2025 recommendations of the American Diabetes Association (ADA), glycemic targets should be individualized based on frailty, disease duration, functional and cognitive status, life expectancy, comorbidities, and the presence of vascular complications [1]. In older adults, geriatric factors such as multimorbidity, polypharmacy, and frailty can substantially affect the choice of treatment targets. Overly tight glycemic control can increase the risk of hypoglycemia, adverse effects, and drug interactions; conversely, overly relaxed targets increase the risk of complications and long-term adverse outcomes. In Vietnam, the 2020 national survey reported a DM prevalence of 7.3% and a prediabetes prevalence of 17.8%; notably, as many as 62.6% of people with DM had not been diagnosed. In the study by Thach Thi Phola, only 44.9% of patients achieved their HbA1c target, and patients aged <65 years were 1.82 times more likely to achieve HbA1c control than those aged ≥65 years [2]. At Thong Nhat Hospital, an analysis of the inpatient morbidity pattern in 2013–2020 showed that disease chapter IV (endocrine, nutritional and metabolic diseases according to ICD-10) had a morbidity rate ranging from 262 to 838 per 1,000 population, with DM accounting for the largest share [3]. Thong Nhat Hospital is a class I general hospital under the Ministry of Health and one of the leading geriatric centers in Vietnam, and it provides a valuable and reliable source of data on older patients. On this basis, we conducted this study to determine the proportion of older patients with type 2 DM who achieve their glycemic control targets and to analyze the association between geriatric factors (frailty, multimorbidity, polypharmacy, cardiovascular risk, etc.) and treatment effectiveness.

2. SUBJECTS AND METHODS

2.1. Study subjects

- Inclusion criteria: Older patients with type 2 DM examined at the Endocrinology Clinic, Thong Nhat Hospital, from April 2025 to August 2025.

- Exclusion criteria: Patients without the laboratory tests needed to assess glycemic control within 3 months of enrollment, and patients who declined to participate in the study.

2.2. Study methods

Study design: Descriptive cross-sectional study

Study procedure and data collection: Eligible patients underwent history taking and clinical examination, and frailty was assessed with the Canadian Clinical Frailty Scale (CFS) [4].

Definitions of study variables

Type 2 diabetes mellitus: patients diagnosed with DM and treated with oral glucose-lowering drugs or insulin for at least 3 months.

Severity of chronic kidney disease: mild (stages 1-2: eGFR (MDRD) ≥60mL/min); moderate (stage 3a: eGFR (MDRD) 45-59mL/min); severe (stages 3b-5: eGFR (MDRD) <45mL/min) [5].

Frailty [4]: assessed with the Clinical Frailty Scale (CFS), introduced in 2005 and revised in 2020, which has 9 levels; patients with CFS ≥ 4 were considered frail.

Cardiovascular risk was assessed according to the ESC 2021 guidelines and graded into 4 levels: low, moderate, high, and very high [6].

Setting the HbA1c target: based on age (cut-off: ≤ 80 years and > 80 years); frailty; coronary and peripheral vascular complications (lower-limb arteries, carotid arteries); microalbuminuria (cut-off: ACR <30mg/g and ≥30mg/g); DM duration (cut-off: ≤10 years and >10 years); and chronic kidney disease (cut-off: eGFR (estimated with the MDRD equation) <60mL/min and ≥60mL/min). Patients with 0-1/5 of these problems were assigned an HbA1c target of <7%, those with 2-3/5 a target of 7-8%, and those with 4-5/5 a target of >8%.

2.3. Data analysis

Data were analyzed with SPSS 25.0. The t-test was used to compare 2 quantitative variables and the χ^2 test to compare 2 categorical variables. $p<0.05$ was considered statistically significant.

2.4. Research ethics

The study was approved with regard to its ethical aspects and safety by the Ethics Committee in Biomedical Research of Thong Nhat Hospital, decision No. 241/2025/CN-BVTN-HĐĐĐ dated April 28, 2025.

3. RESULTS

From April 2025 to August 2025, we enrolled 185 older patients with type 2 DM at the Endocrinology Clinic, Thong Nhat Hospital. The median age was 68 years (64–75.5), and 52.4% were men. The median body mass index (BMI) was 23.1 kg/m^2, which falls in the overweight range of the IDI & WPRO classification. The median DM duration was 10 years.

3.1. Clinical and laboratory characteristics of the study sample

Table 1. Clinical characteristics

	Overall (n=185)	Target achieved (n=84)	Target not achieved (n=101)	p
Age (years)	68 (64-75.5)	67 (63.3-76)	69 (65-75)	0.225
Age ≥80 years, n (%)	23 (12.4)	7 (8.3)	16 (15.8)	0.123
Male, n (%)	97 (52.4)	44 (52.4)	53 (52.5)	0.99
BMI (kg/m^2), n (%)	23.1 (21.5-24.9)	23.1 (21.8-24.4)	23 (21.3-25.2)	0.89
Underweight	6 (3.2)	3 (3.6)	3 (3)	0.872
Normal	83 (44.9)	36 (42.9)	47 (46.5)	
Overweight/obese	96 (51.9)	45 (53.6)	51 (50.5)	
History of hypertension, n (%)	160 (86.5)	74 (88.1)	86 (85.1)	0.559
DM duration (years)	10 (5-20)	10 (3.3-20)	12 (6-20)	0.143
Coronary artery disease, n (%)	60 (32.4)	23 (27.4)	37 (36.6)	0.166
Atherosclerotic peripheral artery disease, n (%)	69 (37.3)	31 (36.9)	38 (37.6)	0.771
Chronic kidney disease, n (%)				0.883
CKD stage 1-2	131 (70.8)	61 (72.6)	70 (69.3)	
CKD stage 3a	42 (22.7)	18 (21.4)	24 (23.8)	
CKD stage 3b-5	12 (6.5)	5 (6)	7 (6.9)	
Polypharmacy, n (%)	145 (78.4)	64 (76.2)	81 (80.2)	0.51
Multimorbidity, n (%)	182 (98.4)	83 (98.8)	99 (98)	0.672
Frailty, n (%)	80 (43.2)	29 (34.5)	51 (50.5)	0.029
Cardiovascular risk, n (%)				0.333
Low	3 (1.6)	2 (2.4)	1 (1)	
Moderate	12 (6.5)	7 (8.3)	5 (5)	
High	132 (71.4)	62 (73.8)	70 (69.3)	
Very high	38 (20.5)	13 (15.5)	25 (24.8)	

The proportion of frail patients was lower in the group that achieved the HbA1c target than in the group that did not, and the difference was statistically significant (p = 0.029). This finding indicates that frailty adversely affects glycemic control in older patients with type 2 DM.

Table 2. Laboratory characteristics

	Overall (n=185)	Target achieved (n=84)	Target not achieved (n=101)	p

Fasting glucose (mmol/L)	7 (6.1-8.8)	6.8 (5.8-7.9)	7.6 (6.4-9.7)	0.01
HbA1c (%)	6.9 (6.4-8.4)	6.7 (6.2-7.6)	7.5 (6.6-8.8)	<0.001
Serum creatinine (µmol/L)	90 (75-104)	91 (78.4-103.8)	90 (75-108.5)	0.637
eGFR (mL/min)	69.1 (58-79.1)	68.6 (57.3-80.5)	69.3 (58.1-78.9)	0.962
Total cholesterol (mmol/L)	4.1 (3.4-5)	4.1 (3.5-4.8)	4 (3.2-5.1)	0.864
Triglyceride (mmol/L)	1.7 (1.2-2.5)	1.8 (1.2-2.5)	1.6 (1.1-2.5)	0.795
LDL-c (mmol/L)	2.04 (1.4-2.8)	2.1 (1.5-2.5)	2 (1.4-2.9)	0.848
HDL-c (mmol/L)	1.2 (1-1.4)	1.2 (1-1.4)	1.2 (1-1.4)	0.355
Dyslipidemia, n (%)	96 (51.9)	45 (53.6)	51 (50.5)	0.677

3.2. Achievement of glycemic targets and geriatric factors associated with glycemic control in older patients with type 2 DM

The proportion of patients achieving the HbA1c target was 45.4%. Other geriatric factors, such as multimorbidity and polypharmacy, were not significantly associated with achieving the treatment target. Univariable and multivariable logistic regression showed that frailty (OR = 0.48; 95% CI: 0.25–0.92; p = 0.027) and high cardiovascular risk (OR = 0.57; 95% CI: 0.32–0.99; p = 0.047) were two independent factors associated with a lower likelihood of achieving the HbA1c target.

Table 3. Logistic regression analysis of geriatric factors associated with achieving the HbA1c target in older patients with type 2 diabetes mellitus

	Univariable analysis			Multivariable analysis		
	OR	95% CI	p	OR	95% CI	p
Age	0.979	0.94 – 1.02	0.301	1.005	0.96 – 1.05	0.828
Multimorbidity	1.677	0.15 – 18.82	0.675	3.57	0.28 – 45.13	0.325
Polypharmacy	0.79	0.39 – 1.59	0.51	0.83	0.39 – 1.75	0.62
Renal impairment	0.851	0.45 – 1.61	0.622	0.88	0.43 – 1.78	0.716
Frailty	0.517	0.29 – 0.94	0.03	0.48	0.25 – 0.92	0.027
Cardiovascular risk	0.613	0.36 – 1.04	0.07	0.57	0.32 – 0.99	0.047

OR: odds ratio; 95% CI: 95% confidence interval; p<0.05 was considered statistically significant

4. DISCUSSION

4.1. Clinical and laboratory characteristics of the study sample

In this study, the median age of older patients with type 2 DM was 68 years, 12.4% were aged 80 years or older, and the median disease duration was 10 years. Most patients had chronic comorbidities, the most common being hypertension (86.5%), followed by atherosclerotic peripheral artery disease (37.3%) and chronic coronary artery disease (32.4%). This pattern is typical of older patients, who often have complex multimorbidity, particularly cardiovascular disease combined with DM. In the study by Thach Thi Phola [2], the prevalence of hypertension was lower (50%), coronary artery disease was more common (45.5%), and peripheral artery disease was less common (5.3%). This difference may be explained by the fact that the study by Thach Thi Phola [2] included adults aged ≥17 years, a younger population than our sample, which focused on older adults. In older patients with long disease duration, the rate of vascular complications (cardiovascular disease, end-stage chronic kidney disease, stroke, amputation) tends to be higher, consistent with the literature [7].

Regarding cardiovascular risk, most older patients with type 2 DM were classified as high (71.4%) or very high (20.5%) cardiovascular risk. The median body mass index (BMI) was 23.1 kg/m^2, and 51.9% of patients were overweight or obese. These data show that a high cardiovascular risk burden, together with overweight, was fairly common in our study population. This result is close to that of Thach Thi Phola [2] (overweight/obesity 53.3%, mean BMI 23.5 ± 3 kg/m^2) and higher than that of Hua Thanh Nhan [8], who reported an obesity rate of 45% with a mean BMI of 24.9 ± 3.5 kg/m^2. The difference may be due to the classification criteria, population characteristics, and abdominal fat distribution in older adults. This high rate shows the need for comprehensive risk factor management, combining weight control, nutrition, physical activity, and drug treatment to reduce cardiovascular events.

Regarding laboratory findings, the prevalence of dyslipidemia in older patients with type 2 DM was 51.9%. The median estimated glomerular filtration rate (eGFR) was 69.1 (58–79.1) mL/min, reflecting mild to moderate renal impairment. Lipid profiles and renal function did not differ between the two HbA1c groups, possibly because of the characteristics of the study population and the influence of many other factors (age, disease duration, current medications). These results indicate that glycemic control alone is not enough; a multifactorial strategy (statins, ACE inhibitors/angiotensin receptor blockers, SGLT2i, lifestyle changes) is needed to manage cardiorenal risk in older patients.

4.2. Proportion of patients achieving the HbA1c target

In our study, 45.4% of older patients with type 2 DM achieved their HbA1c target. This figure reflects limited glycemic control: about half of the patients did not reach their treatment target. This result is similar to that of Thach Thi Phola [2] and higher than that of Nguyen Thi Thanh Nga [9] at Nguyen Trai Hospital, where only 11.1% of patients achieved their HbA1c target. The difference may be due to differences in study population characteristics, assessment methods, and clinical practice settings. Studies worldwide have reported widely varying rates of HbA1c target achievement in older adults. For example, Fritsche et al. reported that 54.3% of patients aged ≥65 years achieved their individualized HbA1c target 12 months after starting basal insulin [10]. Meanwhile, an analysis of NHANES 2001–2010 showed that 61.5% of people aged ≥65 years in the United States had HbA1c <7% [11]. The low rate of HbA1c target achievement in our study may be related to the characteristics of this older population, with long disease duration, multimorbidity, and frailty, which make treatment adherence more difficult and limit drug choices. In addition, differences between studies may reflect different definitions of the HbA1c target and different levels of access to newer treatments (insulin analogues, newer drugs such as SGLT2i or GLP-1RA). HbA1c control in older adults should be individualized, prioritize safety, and fit the local practice setting rather than apply a single threshold to all patients.

4.3. Association between geriatric factors and achievement of the HbA1c target

Multivariable logistic regression showed that frailty (OR = 0.48; 95% CI: 0.25–0.92; p = 0.027) and high cardiovascular risk (OR = 0.57; 95% CI: 0.32–0.99; p = 0.047) were two independent factors that reduced the likelihood of achieving the HbA1c target. Other geriatric factors, such as multimorbidity and polypharmacy, were not significantly associated with glycemic control. In addition, the study by Vu Quang Hung [12] in 371 patients with type 2 DM in Thai Binh also found several factors affecting HbA1c target achievement, including disease duration, diet, smoking, and vascular complications. Our results therefore add evidence that, in older patients, geriatric factors such as frailty and cardiovascular risk are particularly important. Several mechanisms may explain this association. Frailty reflects reduced physiological reserve, muscle mass, mobility, and cognitive function, which makes it harder for patients to adhere to treatment and to maintain diet and exercise, and this in turn affects glycemic control. High cardiovascular risk, in turn, is often linked to a burden of vascular disease and multiple comorbidities, which limits the choice and optimization of glucose-lowering drugs because of concerns about adverse effects or drug interactions. This study has limitations: its cross-sectional

design, the lack of data on nutrition, cognition, and adherence, and its conduct at a single center. Our findings indicate that glycemic control in older adults with type 2 DM should be individualized and based not only on conventional factors but also on geriatric characteristics. In particular, frailty and cardiovascular risk should be assessed routinely in practice, because they are two independent factors affecting the likelihood of reaching treatment targets. In practice, clinicians should consider setting more appropriate HbA1c targets for patients who are frail or at high cardiovascular risk, to balance the long-term benefits of glycemic control against the risk of complications from overtreatment, especially hypoglycemia.

5. CONCLUSION

Glycemic control in older patients with type 2 diabetes mellitus remains a challenge, and the proportion of patients achieving their HbA1c target is still limited. Our analysis showed that frailty and high cardiovascular risk were two independent factors that reduced the likelihood of achieving the HbA1c target.

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