

Original Research Article

Status of Blood Glucose Control and Treatment Adherence in Type 2 Diabetes Patients at Tra Vinh General Hospital

Nguyen Hieu Thao^{1*}, Nguyen Thi Bao Xuyen¹, Tran Thanh Tung¹¹College of Medicine and Pharmacy, Tra Vinh University

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Abstract: Background: Diabetes is a common chronic disease, in which blood glucose control and treatment adherence are key factors aimed at preventing complications. However, practical evidence at the provincial level concerning these factors is still not fully updated. **Methods:** A descriptive cross-sectional study was conducted on 162 patients with type 2 diabetes receiving outpatient treatment at the Department of Cardiology - Geriatrics, Tra Vinh General Hospital, from May to August 2024. Data were collected through face-to-face interviews and medical records. Fasting blood glucose control was classified according to the criteria of the American Diabetes Association (ADA). **Results:** The rate of good blood glucose control (4.4-6.1 mmol/L) was 21.0%; acceptable control (6.2-7.0 mmol/L) was 9.2%; and poor control (<4.4 or >7.0 mmol/L) accounted for 69.8%. A total of 92.6% of patients had full treatment adherence, but only 37.7% regularly monitored their blood glucose at home. The rate of alcohol consumption was low (4.3%). **Conclusion:** Despite high treatment adherence rates, the majority of patients failed to achieve optimal glycemic control. Strengthening patient education and supporting home monitoring are necessary to improve treatment outcomes.

Keywords: Type 2 Diabetes, Blood Glucose Control, Treatment Adherence, Self-Monitoring of Blood Glucose, Related Factors, Outpatients.

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INTRODUCTION

Diabetes mellitus (DM) is a common, chronic endocrine and metabolic disorder whose prevalence is rapidly increasing, making it one of the top three non-communicable diseases (NCDs) worldwide, as well as in Vietnam. The World Health Organization (WHO) has warned that the 21st century is the “century of endocrine diseases and metabolic disorders” in which diabetes is considered one of the main causes of the global burden of disease, similar to the HIV/AIDS epidemic at the end of the 20th century [1]. According to the International Diabetes Federation (IDF), approximately 537 million people worldwide had DM in 2021, marking an increase of 112 million from 2017. It is estimated that 1 in 10 adults (aged 20-79) has the disease. In Vietnam, a 2021 survey by the Ministry of Health (MOH) showed that the prevalence of DM in adults was 7.1%, equivalent to nearly 5 million people, representing an increase of 1.5 million people in just 4 years [2].

Alarming, a large proportion of patients are not diagnosed early, the rate of delayed detection is high, and the disease is increasingly trending towards a younger age of onset. Concurrently, the rate of failing to achieve target blood glucose control remains high. A

study by Dinh Thi Hue noted that only 39.1% of patients achieved glycemic control [3]. Tran Thi Tam reported that up to 42.9% of patients had poor fasting blood glucose control [4]. Complications of DM seriously affect the cardiovascular system, kidneys, eyes, nerves and increase mortality rates. DM increases the risk of cardiovascular disease by 2-4 times and is also the third leading cause of death in Vietnam, following cardiovascular disease and cancer [1-5]. Numerous clinical trials have confirmed that intensive glycemic control significantly reduces microvascular complications, decreases cardiovascular complications by up to 50% and lowers mortality rates by 60-70% in patients with type 2 DM [6-8].

In Tra Vinh, a coastal province in the Mekong Delta with a population of over 1 million, where the Khmer ethnic group accounts for approximately 32%, Tra Vinh General Hospital receives a large number of DM patients annually. In 2019, there were over 429,000 outpatient visits, with DM accounting for more than one-third of all cases [5]. However, significant challenges remain in community awareness of the disease, treatment adherence and blood glucose control, particularly among the elderly and ethnic minority groups. Therefore, this study was conducted to assess the status of blood glucose

control and treatment adherence among type 2 DM patients receiving outpatient treatment at Tra Vinh General Hospital in 2024. The findings of this study are expected to provide crucial practical data, helping to inform more effective local treatment and patient management strategies.

MATERIALS AND METHODS

Research Subjects

Inclusion Criteria: Patients with a diagnosis of type 2 DM, receiving outpatient treatment at the Department of Internal Medicine – Cardiology – Geriatrics, Tra Vinh General Hospital, who provided consent for the study.

Exclusion Criteria: Communication impairments (muteness, deafness, confusion, psychiatric disorders, unstable mental state); missing blood glucose test results; gestational diabetes; and lactation within 12 months postpartum.

Research Location and Time: The study was conducted at the Department of Cardiology – Geriatrics, Tra Vinh General Hospital, from May 2024 to August 2024.

Study Design: Descriptive cross-sectional study.

Sample size

The sample size was calculated using the formula for estimating a single proportion:

$$n = Z_{1-\frac{\alpha}{2}}^2 \frac{p(1-p)}{d^2}$$

In which:

n: The required sample size. $Z_{1-\frac{\alpha}{2}}$: The Z-score corresponding to the confidence level. For a 95% confidence interval (CI), this value is $Z_{1-\frac{\alpha}{2}} = 1.96$. p: The estimated population proportion. We used an estimated proportion of 0.249 (24.9%), representing the rate of glycemic control among type 2 DM patients as reported in a prior study by Doan Thi Thuy Tinh (2022) [11]. d: The desired margin of error (precision), set at d=0.07. This calculation yielded a preliminary sample size of n=147. To account for potential non-response or data collection errors, a 10% contingency was added, resulting in a final target sample size of n=162 participants.

Data Collection and Analysis: Data were managed analyzed using Stata 14 and Microsoft Excel.

Ethical Considerations: The study was approved by the Ethics Committee of Tra Vinh University (Decision No. 235/GCT-HĐĐĐ, dated May 15, 2024) before implementation. The research was conducted purely for scientific purposes. Participants were fully informed, provided voluntary consent and had the right to withdraw at any time. Personal information was kept confidential, the questionnaire contained no sensitive content and the rights of the participants were protected.

RESULTS

A. The Rate of Blood Glucose Control in Type 2 Diabetes Patients

Table 1: Results of fasting blood glucose control (n=162)

Fasting glucose	Frequency (n)	Percentage (%)
Blood glucose	Mean ± SD: 14 ± 10.07 mmol/L	
	Max: 59.94 mmol/L, Min: 2.14 mmol/L	
Good	34	21.0
Acceptable	15	9.2
Poor	113	69.8

(Mean±SD: Mean ± Standard Deviation, Max: Maximum value, Min: Minimum value)

Among the total of 162 patients, 34 patients (21.0%) achieved good glycemic control, 15 patients (9.2%) achieved acceptable control and 113 patients (69.8%) had poor control. The mean fasting blood glucose of the study group was 14.0 ± 10.07 mmol/L,

with a maximum value of 59.94 mmol/L and a minimum value of 2.14 mmol/L.

B. Characteristics of Habits and Adherence in Type 2 Diabetes Patients

Table 2: Characteristics of habits and adherence among study participants (n=162)

Characteristic		Frequency (n)	Percentage (%)
Medication adherence	Yes (on time, correct dose, on-schedule follow-ups)	150	92.6
	No (incorrect time/dose, missed doses, late follow ups)	12	7.4
Alcohol consumption	Yes	7	4.3
	No	155	95.7
Adherence to home blood glucose monitoring	Yes	61	37.7
	No	101	62.3

The research results showed a high rate of medication adherence, with 92.7% of the 162 patients complying with their treatment. Regarding alcohol consumption habits, 155 patients (95.7%) did not consume alcohol, while 7 patients (4.3%) did. As for home blood glucose self-monitoring, only 61 patients

(37.7%) performed regular checks, while the remaining 101 patients (62.3%) did not monitor their blood glucose at home.

C. Association between Blood Glucose Control and Some General Characteristics of the Study Subjects

Table 3: Association between blood glucose control, habits and adherence among study participants

Characteristic		Blood glucose control		PR KTC 95%	p
		Achieved n (%)	Not achieved n (%)		
Medication adherence	Yes	38 (25.3)	112 (74.7)	0.99 (0.7-1.4)	0.980
	No	3 (25.0)	9 (75.0)	1	
Alcohol consumption	Yes	0(0.0)	7 (100.0)	1.35 (1.23-1.50)	0.115
	No	41 (26.4)	114 (73.6)	1	
Home blood glucose monitoring	Yes	17 (27.8)	44 (72.2)	94 (0.78-1.14)	560
	No	24 (23.8)	77 (76.2)	1	

Among the 162 study participants, the majority failed to achieve target glycemic control, regardless of their treatment adherence status, alcohol consumption habits, or home blood glucose self-monitoring. Specifically, the rate of uncontrolled glycemia was similar between the groups with and without medication adherence, as well as between those who did and did not

perform home blood glucose monitoring. In the group that consumed alcohol, the rate of uncontrolled glycemia was higher; however, this difference was not statistically significant ($p > 0.05$). The analysis showed no significant association between blood glucose control and these factors, with the 95% confidence intervals (95% CI) being 0.7-1.4, 1.23-1.50 and 0.78-1.14, respectively.

Table 4: Association between blood glucose control and demographic characteristics of the study subjects

Characteristic		Blood glucose control		PR KTC 95%	p
		Achieved n (%)	Not achieved n (%)		
Sex	Male	11 (22.0)	39 (78.0)	1.06 (0.88-1.28)	0.518
	Female	30 (26.8)	82 (73.2)	1	
Residence	Rural	33 (23.6)	107 (76.4)	1.2 (0.86-1.66)	0.227
	Urban	8 (36.3)	14 (63.7)	1	
Age Group	< 40 years	0 (0.0)	6 (100.0)	1	0.001
	40-49 years	2 (12.5)	14 (87.5)	0.88 (0.81-0.95)	
	50-59 years	7 (18.9)	30 (81.1)	0.77 (0.66-0.90)	
	≥ 60 years	32 (31.1)	71 (68.9)	0.68 (0.54-0.85)	

The rate of uncontrolled glycemic control in males was 1.06 times higher than in females (95% CI: 0.88-1.28); however, this difference was not statistically significant ($p > 0.05$). Regarding residence, the rates of uncontrolled glycemia were 76.4% in rural areas and

63.7% in urban areas, respectively. This difference was also not statistically significant (PR=1.2, 95% CI: 0.86-1.66; $p > 0.05$). The study found a statistically significant association between age group and glycemic control ($p = 0.001$).

Table 5: Association between blood glucose control, social characteristics and BMI of the study subjects

Characteristic		Blood glucose control		PR KTC 95%	p
		Achieved n (%)	Not achieved n (%)		
Occupation	Worker	0 (0.0)	5 (100.0)	1	0.084
	Farmer	3 (11.6)	23 (88.4)	0.88 (0.76-1.01)	
	Retired	31 (33.0)	63 (67.0)	0.67 (0.58-0.77)	
	Other	7 (19.0)	30 (81.0)	0.81 (0.7-0.94)	
Education Level	Illiterate	6 (16.2)	31 (83.8)	1	0.104
	Primary school	25 (28.8)	62 (71.2)	0.85 (0.7-1.03)	
	Secondary school	10 (31.2)	22 (68.8)	0.82 (0.62-1.07)	
	College/University	0 (0.0)	6 (100.0)	1.2 (1.03-1.37)	
BMI	Underweight	1 (8.3)	11 (91.7)	1	0.025
	Normal weight	23 (28.8)	57 (71.2)	0.70 (0.62-0.96)	
	Overweight/Obese	17 (24.2)	53 (75.8)	0.80 (0.65-1.02)	

Among the social and BMI characteristics, the results showed a statistically significant association between uncontrolled glycemic control and a college/university education level ($p = 0.015$; 95% CI: 1.03-1.37). In the lower education groups, such as illiterate, primary school and secondary school, the differences were not statistically significant ($p > 0.05$). Furthermore, a normal BMI was significantly associated with glycemic control among the study participants ($p < 0.05$).

DISCUSSION

A. The Rate of Blood Glucose Control in Type 2 Diabetes Patients

At Tra Vinh General Hospital, this study found that the rate of achieving target fasting blood glucose control (including “good” and “acceptable” levels) was 30.2%, with 21.0% having good control, 9.2% acceptable control and 69.8% poor control. The group’s mean blood glucose was 14.0 ± 10.07 mmol/L (range: 2.14-59.94 mmol/L), reflecting the limited glycemic control status among outpatients at the provincial level. This result is relatively higher than that of a study by Do Van Doanh [10], which reported a good control rate of 18.2%, while Dao Thi Chuc Tho [11], recorded an acceptable control rate of 21.03%. However, the rate of poor control in the current study (69.8%) was approximately 1.4 times higher than that reported by Doan Thi Kim Chau, which stated that 49.3% of patients did not achieve the target [12]. The discrepancies between studies may stem from differences in demographic characteristics, disease duration, sample size, assessment criteria and varying levels of treatment adherence. For outpatients, inadequate adherence to diet, exercise and medication regimens, coupled with a lack of home blood glucose self-monitoring, are common reasons for suboptimal glycemic control. Despite advancements in treatment regimens, clinical outcomes still depend primarily on the patient’s self-care awareness, adherence, and collaboration with healthcare providers. Clinically, poor blood glucose control increases the risk of cardiovascular, renal and retinal complications, prolongs treatment duration and increases healthcare costs [9-13]. Therefore, these findings highlight the necessity of enhancing individualized treatment counseling and health education for patients. This aims to help them fully understand the importance of blood glucose self-monitoring, adhering to treatment protocols and making lifestyle modifications.

B. Characteristics of Habits and Adherence in Type 2 Diabetes Patients

In our study, the majority of patients (95.7%) did not consume alcohol, with only 4.3% reporting alcohol use. This result is similar to a study by Trinh Thi Ngoc Huyen, which noted that 88.2% of patients did not drink alcohol [14]. This suggests a general trend of adherence to recommendations to limit alcoholic beverages among patients with type 2 diabetes. This may reflect the effectiveness of counseling, communication

and chronic disease management efforts at the provincial level, which help patients better understand the adverse impacts of alcohol on blood glucose control and cardiovascular complications [15]. Furthermore, counseling on alcohol limitation should be integrated into follow-up appointments and outpatient management programs. Family involvement should also be encouraged to support, monitor and motivate patients in maintaining a healthy lifestyle.

Regarding home blood glucose self-monitoring, the study noted that 37.7% of patients performed it regularly. This rate is comparable to a study by Pham Le Duy Bao (36.1%) but significantly higher than that reported by Pham Thi Kim Yen (3.1%) in the same locality [16]. These discrepancies may stem from socioeconomic conditions, access to blood glucose monitoring devices and the patients’ level of understanding regarding the benefits of home monitoring. In clinical practice, proactive blood glucose monitoring by patients allows physicians to accurately assess treatment efficacy, make timely medication adjustments and enable the early detection of glycemic fluctuations. Therefore, enhancing patient education on glucometer skills and encouraging patients to maintain a routine of home self-monitoring are essential for improving the quality of disease management.

Regarding medication adherence, 92.6% of the study participants used medication on time, at the correct dose and attended follow-up appointments as scheduled, while 7.4% did not fully adhere. This high adherence rate reflects patients’ growing awareness of the importance of treatment adherence for long-term blood glucose control. This finding is consistent with trends reported in many domestic studies, which indicate that the majority of type 2 diabetes patients recognize the essential role of regular medication use in disease management. However, missing doses or late follow-up attendance is still found among certain patient groups, such as the elderly, those with lower educational attainment, or individuals living alone, often due to memory constraints and a lack of family support. These factors are considered significant barriers to maintaining long-term treatment adherence, particularly at the primary healthcare level. To improve medication-taking behavior, individualized counseling programs should be implemented, emphasizing the importance of taking medication on time and at the correct dosage. Furthermore, the use of digital health technologies such as SMS reminders for appointments, medication management applications, or periodic reminder calls from healthcare staff could significantly improve adherence levels.

C. Association between Blood Glucose Control and Some General Characteristics of the Study Subjects

Analysis of 162 patients with type 2 diabetes showed no statistically significant association between blood glucose control and treatment adherence, alcohol consumption habits, or home blood glucose self-

monitoring ($p > 0.05$). The rate of uncontrolled glycemic control was similar between the medication-adherent and non-adherent groups (74.7% vs. 75.0%) and between those who did and did not self-monitor their blood glucose (72.2% vs. 76.2%). Although the group that consumed alcohol had a 1.35-fold higher rate of uncontrolled glycemia, the difference was not statistically significant. This result may be due to the limited sample size and the small degree of difference between the groups, which reduced the statistical power. Nevertheless, the trend toward better glycemic control in the home self-monitoring group suggests the importance of regular blood glucose monitoring to help patients identify glycemic fluctuations early and make appropriate lifestyle adjustments.

The study found that the rate of uncontrolled blood glucose control was 78.0% in males, higher than in females (73.2%); however, this difference was not statistically significant ($p > 0.05$). This small discrepancy may be explained by the limited sample size and the lower proportion of males compared to females in the study population, which reduced the statistical power of the test. This finding is consistent with several previous studies that also reported no significant difference in glycemic control between sexes. This is despite the fact that males often tend to have poorer control, which is frequently attributed to less adherent lifestyle habits, such as higher rates of smoking and alcohol consumption. Additionally, females often show greater health-seeking behavior, better treatment adherence and more timely attendance at follow-up appointments, all of which contribute to improved glycemic control. Overall, although gender was not found to be a statistically significant factor in this study, the findings still suggest that educational interventions and behavioral management should place a greater emphasis on male patients. This is aimed at enhancing treatment adherence and minimizing risk behaviors that impact long-term glycemic control.

Regarding residence, the rate of uncontrolled glycemic control among rural patients (76.4%) was higher than among urban patients (63.7%); however, this difference was not statistically significant ($p > 0.05$). The cause may be related to differences in socioeconomic conditions, access to healthcare services, and health literacy levels between the two areas. In rural regions, patients often have difficulty accessing specialists and receive less nutritional counseling and health education, leading to ineffective blood glucose control. However, the sample size of the urban patient group in this study was small, making it insufficient to confirm a true difference between the two population groups.

Age group was significantly associated with glycemic control ($p = 0.001$). Specifically, the proportion of patients with uncontrolled blood glucose decreased progressively with increasing age: 100% in those under 40 years, 87.5% in the 40-49 age group, 81.1% in the 50-

59 group and 68.9% among patients aged ≥ 60 years. This finding indicates that older patients tended to achieve better blood glucose control. The result is consistent with the study by Huynh Phi Hung, in which the proportion of patients with uncontrolled blood glucose among those aged over 55 years was 72.2%, comparable to our findings [17]. The difference can be explained by the fact that older patients often have a longer disease duration, receive more consistent follow-up and treatment, and adhere better to medical advice, whereas younger patients tend to be more complacent and less compliant with diet and exercise recommendations due to work pressure and busy lifestyles. Moreover, age is itself an important biological risk factor in the progression of type 2 diabetes mellitus. As age increases, hepatic and renal functions as well as insulin sensitivity decline, often accompanied by chronic comorbidities such as hypertension, dyslipidemia and obesity, which further complicate glycemic management. The present finding is also consistent with the trend reported by the International Diabetes Federation (IDF, 2023), which showed that the prevalence of type 2 diabetes increases with age and individuals aged ≥ 60 years account for nearly half of all global cases [18]. This emphasizes the importance of implementing age-specific management programs, health education and behavioral interventions to enhance long-term blood glucose control outcomes.

The analysis revealed a statistically significant association between occupation and blood glucose control ($p < 0.05$). Patients in the “elderly” group (retired or no longer working) had a lower proportion of uncontrolled blood glucose (67.0%) compared to farmers (88.4%) and those with other occupations such as traders or office workers (81.0%). Meanwhile, the worker group showed the highest rate of uncontrolled blood glucose (100%); however, the small sample size in this subgroup limits the ability to draw firm conclusions about this association. This finding may be explained by the fact that elderly or retired individuals have more time for regular medical follow-ups and tend to adhere better to treatment regimens. In contrast, workers and self-employed individuals often have busy schedules, limited physical activity, irregular diets.

Regarding educational attainment, there was a statistically significant association between education level and blood glucose control ($p = 0.015$). Specifically, patients with a college or university degree had the highest proportion of uncontrolled blood glucose (100%, PR = 1.2; 95% CI: 1.03-1.37). This result appears to contrast with most previous studies, in which higher education was generally associated with better disease understanding and treatment adherence. In contrast, the current study found that individuals with higher education levels demonstrated poorer blood glucose control. This paradoxical finding may be explained by the nature of intellectual occupations, which often involve high work intensity, sedentary lifestyles,

irregular dietary habits and prolonged psychological stress all of which are known risk factors for glycemic imbalance. Moreover, the small sample size and the limited number of participants with higher education in this study may have influenced the observed statistical association. Therefore, larger-scale studies with stratification by occupation type and work-related stress levels are warranted to clarify this relationship. For individuals with higher education, targeted interventions should emphasize stress management, increased physical activity, healthy dietary habits and balanced work rest schedules to improve long-term blood glucose control.

The results showed that BMI was significantly associated with glycemic control ($p < 0.05$). Patients with a normal BMI achieved better glycemic control compared with underweight individuals (PR = 0.70; 95% CI: 0.62-0.96), suggesting that being underweight or malnourished may adversely affect glucose metabolism. This finding is consistent with those reported by Dao Thi Chuc Tho [11], and Huynh Phi Hung [17], in which patients with a normal BMI demonstrated better glycemic control than those who were either underweight or overweight. The difference may be explained by the fact that individuals with a balanced BMI generally have better nutritional status and lean body mass, leading to more stable insulin responsiveness and drug tolerance, whereas underweight patients are more prone to metabolic disturbances and impaired hepatic or renal function. Several international studies have also reported similar trends, noting higher risks of poor glycemic control and complications among individuals with low BMI. These findings highlight the importance of maintaining an optimal BMI through appropriate diet and regular physical activity to optimize blood glucose control in patients with type 2 diabetes mellitus.

CONCLUSION

This study revealed that the rate of blood glucose control among outpatients with type 2 diabetes at Tra Vinh General Hospital remained low, with only 30.2% of patients achieving the target fasting blood glucose level. Although the majority of patients demonstrated good adherence to medication (92.6%), the proportion who regularly performed self-monitoring of blood glucose at home was suboptimal (37.7%), indicating an inconsistency between treatment adherence and self-management capacity. Analysis of associated factors showed that age, occupation, education level, BMI significantly influenced glycemic control. Older, retired patients and those with normal BMI achieved better control, whereas individuals with higher educational attainment tended to have poorer glycemic outcomes possibly due to occupational stress, sedentary lifestyle and irregular dietary habits. In contrast, gender, place of residence, medication adherence and alcohol consumption were not significantly associated with blood glucose control. These findings underscore the importance of individualized patient management,

particularly among those at risk of poor glycemic control. Health education, lifestyle modification counseling and guidance on home blood glucose monitoring should be reinforced, alongside dietary optimization and stress management. Close collaboration among physicians, nurses and family members plays a pivotal role in improving the overall effectiveness of diabetes management and long-term glycemic outcomes.

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