

# HbA1c CONTROL AND ASSOCIATED FACTORS AMONG TYPE 2 DIABETES PATIENTS IN THAI BINH

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## ABSTRACT

**Objective:** This study was conducted to investigate HbA1c control and associated factors among type 2 diabetes patients in Thai Binh in 2024, to evaluate the rate of achieving the HbA1c control target, and to identify factors related to this control.

**Method:** The study included 371 type 2 diabetes patients in Thai Binh. Demographic information, underlying diseases, lifestyle habits, diet, and treatment methods were collected and analyzed. HbA1c levels and fasting blood glucose results were recorded. Factors related to HbA1c control were analyzed using statistical methods.

**Results:** The percentage of patients achieving the HbA1c control target (< 6.5%) was 19.9%. Factors such as disease duration, diet, smoking, and complications had a significant impact on HbA1c control. Patients with longer disease duration and complications were at higher risk of not achieving the HbA1c target.

**Conclusion:** Adhering to an appropriate diet and treatment regimen can help improve the rate of HbA1c control. Intervention strategies should focus on raising awareness and improving patients' lifestyle habits.

**Keywords:** Type 2 diabetes, HbA1c, glucose control, Thai Binh, influencing factors, diet.

## I. INTRODUCTION

Type 2 diabetes (T2D) is a chronic metabolic disorder characterized by hyperglycemia resulting from a combination of insulin resistance and reduced insulin secretion. According to the International Diabetes Federation (IDF), an estimated 463 million adults worldwide were living with diabetes in 2019, and this number is expected to rise to 700 million by 2045 [1].

In Vietnam, type 2 diabetes has become a significant public health issue. According to the DiabCare Asia study in 2015, the percentage

of patients with type 2 diabetes in Vietnam who achieved the HbA1c control target (<7%) was only 36.1%, with an average HbA1c value of 7.9% [2].

HbA1c control is a crucial factor in managing diabetes, helping to reduce the risk of developing chronic complications such as cardiovascular disease, kidney failure, and nerve damage. However, the rate of patients achieving the HbA1c control target remains low, indicating the need for more effective interventions in managing and treating type 2 diabetes.

The study "Current Status of HbA1c Control in Type 2 Diabetes Patients in Thai Binh in 2024" aims to evaluate the rate of HbA1c control and the factors associated with this control in type 2 diabetes patients in Thai Binh. The study's findings will provide important information to improve the quality of treatment and management of type 2 diabetes in the local area.

## II. SUBJECTS AND METHODS

### 2.1. Study Subjects

#### Inclusion criteria:

The study subjects are patients diagnosed with type 2 diabetes who are receiving treatment at medical facilities in Thai Binh in 2024. The patients participating in the study must meet the following criteria:

Diagnosed with type 2 diabetes according to the World Health Organization (WHO) criteria.

Aged 18 years or older.

Willing to participate in the study and sign an informed consent form.

#### Exclusion criteria:

Patients with the following characteristics will be excluded from the study:

Type 1 diabetes or secondary diabetes.

Acute or unstable diseases (such as severe infections, acute cardiovascular diseases, acute liver or kidney diseases).

Patients who are unable to participate or refuse to participate in the study.

### 2.2. Research Methodology

#### 2.2.1. Study Design:

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The study was conducted using a cross-sectional descriptive design to collect and analyze data from type 2 diabetes patients in Thai Binh in 2024. The main objective of the study was to assess the rate of HbA1c control and the factors related to this control.

**2.2.2. Sample Size:**

The sample size for the study is 371 type 2 diabetes patients, selected from medical facilities in Thai Binh. The sample size was calculated based on an acceptable margin of error and a 95% confidence level, with the referenced prevalence from previous studies.

**2.2.3. Sampling Method:**

The sampling method used is convenience sampling from patients visiting medical facilities. Patients selected must meet the inclusion criteria and not fall under the exclusion criteria. Selection was done randomly among the patients present at the hospitals during the study period.

**2.2.4. Study Variables and Indicators:**

Main study indicators: HbA1c levels (percentage) and fasting blood glucose (mmol/l).

Study variables: Factors related to HbA1c control, including:

Demographics: Gender, age, occupation, living area.

Lifestyle: Diet, physical exercise, smoking habits, alcohol consumption.

Disease duration: Duration of type 2 diabetes.

Treatment regimen: Type of medication used (oral medications, insulin, or combination).

Complications: Diabetes-related complications such as cardiovascular disease, neuropathy, nephropathy, and retinopathy.

**2.2.5. Data Collection and Analysis:**

Research data will be collected through interview questionnaires and patient medical records. Information on demographics, lifestyle, treatment regimen, and complications will be recorded. HbA1c levels and fasting blood glucose will be measured and recorded at participating medical facilities.

The adherence levels for diet, exercise, and treatment will be assessed based on the following criteria:

**Good adherence:** Patients who follow dietary recommendations, exercise routines, and treatment protocols (e.g., taking medication or insulin as prescribed) for more than 80% of the time.

**Poor adherence:** Patients who follow dietary recommendations, exercise routines, and treatment protocols less than 50% of the time.

**Regular exercise:** Patients who engage in at least 150 minutes of physical activity per week, or participate in exercise at least three times a week.

**Irregular exercise:** Patients who do not engage in regular physical activity or have inconsistent exercise habits (e.g., less than 2 sessions per week, or sporadic participation in physical activities).

**2.3. Ethical Considerations:**

The study adheres to ethical principles in medical research to ensure the protection of patient rights.

All patients participating in the study were fully informed about the purpose of the study and assured of the confidentiality of their personal information.

**III. RESULTS**

*Table 1. Distribution of study subjects by gender and age*

Characteristics	Male (n = 207)	Female (n = 164)	Total (n = 371)
Gender			
Male (%)	55.8%		
Female (%)		44.2%	
Age			
< 50 years	18 (4.9%)	10 (2.7%)	28 (7.6%)
50-64 years	55 (14.8%)	52 (14%)	107 (28.8%)
≥ 65 years	134 (36.1%)	102 (27.5%)	236 (63.6%)

**Gender:** Males accounted for a higher proportion than females, with males representing 55.8% and females 44.2%. The difference is statistically significant (p = 0.026), with the male group being 1.3 times larger than the female group.

**Age:** The age group  $\geq 65$  years had the highest proportion (36.6%), followed by the 50-64 years group (28.8%), and the under 50 years group had the lowest proportion (7.6%).

**Table 2. Distribution of study subjects by lifestyle and treatment regimen**

Characteristics		Frequency (n)	Percentage (%)
Smoking	Currently smoking	60	16.2
	Previously smoked	128	34.5
	Never smoked	183	49.3
Alcohol consumption	Yes	88	23.7
	No	283	76.3
Diet	Good adherence	254	68.5
	Poor adherence	116	31.3
Exercise	Regular exercise	173	46.6
	Irregular exercise	198	53.4
Medication	Oral medication	153	41.2
	Insulin injection	117	31.5
	Combination	101	27.2
Treatment adherence	Good adherence	302	81.4
	Poor adherence	69	18.6

From Table 2, it can be observed that most type 2 diabetes patients have relatively healthy lifestyle habits. The current smoking rate is only 16.2%, and the alcohol consumption rate is 23.7%. The majority of patients adhere well to their diet (68.5%). However, the rate of patients who exercise regularly is quite low, with 46.6% exercising regularly and 53.4% not following a regular exercise routine. Regarding treatment, the proportions of patients using oral medication, insulin injections, and combination therapy are fairly similar, with 81.4% of patients adhering well to their treatment regimen.

**Table 3. HbA1c control characteristics of the study subjects**

Characteristics	Frequency (n)	Percentage (%)
Achieved target $< 6.5\%$	74	19.9
Did not achieve target $\geq 6.5\%$	297	80.1
Total	371	100

Among the 371 study participants, 74 (19.9%) achieved the HbA1c target ( $< 6.5\%$ ).

**Table 4. Influence of several factors related to patients on HbA1c levels of the study subjects**

Characteristics	n (%)	HbA1c		p*	OR (95% CI)
		Achieved target (n, %)	Not achieved target (n, %)		
Gender	Male	207(55.8)	41(19.8)	0.94	1.02 (0.61-1.70)
	Female	164(44.2)	33(20.1)		
BMI	Underweight	18(4.9)	2(11.1)	0.32	-
	Normal weight	328(88.4)	70(21.3)		
	Overweight	22(5.9)	2(9.1)		
	Obesity	3(0.8)	0(0.0)		

Characteristics		n (%)	HbA1c		p*	OR (95% CI)
			Achieved target (n, %)	Not achieved target (n, %)		
Duration of disease	< 5 years	107(28.9)	30(28)	77(72)	0.03	1
	5-10 years	124(33.4)	24(19.4)	100(80.6)		1.62 (0.88-2.99)
	>10 years	140(37.7)	20(14.3)	120(85.7)		2.34 (1.24-4.41)
Smoking	Currently smoking	60(16.2)	4(6.7)	56(93.3)	0.02	1
	Previously smoked	128(34.5)	29(22.7)	99(77.3)		0.24 (0.08-0.72)
	Never smoked	183(49.3)	41(22.4)	142(77.6)		0.25 (0.09-0.73)
Alcohol consumption	Yes	88(23.7)	13(14.8)	75(85.2)	0.16	1.59 (0.83-3.05)
	No	283(76.3)	61(21.6)	222(78.4)		
Diet	Good adherence	255(68.7)	65(25.5)	190(74.5)	0.00	0.25 (0.12-0.53)
	Poor adherence	116(31.3)	9(7.8)	107(92.2)		
Exercise	Irregular exercise	173(46.6)	30(17.3)	143(82.7)	0.24	1.36 (0.81-2.28)
	Regular exercise	198(53.4)	44(22.2)	154(77.8)		
Complications	Present	207(55.8)	30(14.5)	177(85.5)	0.003	2.16 (1.29-3.63)
	Absent	164(44.2)	44(26.8)	120(73.2)		
Hypertension	Present	275(74.1)	59(21.5)	216(78.5)	0.22	0.68 (0.36-1.26)
	Absent	96(25.9)	15(15.6)	81(84.4)		
Dyslipidemia	Present	155(41.8)	28(18.1)	127(81.9)	0.44	1.23 (0.73-2.07)
	Absent	216(58.2)	46(21.3)	170(78.7)		

Several factors are statistically significantly related to the level of HbA1c control. Specifically, patients with a disease duration of more than 10 years and those with complications have a higher risk of not achieving the HbA1c target, with ORs of 2.34 and 2.16, respectively. Patients who have never smoked or have smoked in the past have a lower risk of not achieving the HbA1c target compared to current smokers (OR = 0.25 and 0.24). Good dietary adherence also reduces the risk of not achieving the HbA1c target (OR = 0.25). Factors such as age, exercise, alcohol consumption, hypertension, and dyslipidemia did not show a statistically significant relationship with HbA1c control ( $p > 0.05$ ).

**Table 5. The influence of lipid indices on HbA1c in the study subjects**

Characteristics		n (%)	HbA1c		p*	OR (95% CI)
			Achieved targetn (%)	Not achieved target n (%)		
Cholesterol	High > 6.2 mmol/l	50(13.5)	3(6)	47(94)	0.02	1
	Near high 5.2-6.2 mmol/l	71(19.1)	18(25.4)	53(74.6)		0.19 (0.05-0.69)
	Normal < 5.2 mmol/l	250(67.4)	53(21.2)	197(78.8)		0.24 (0.07-0.79)

Characteristics		n (%)	HbA1c		p*	OR (95% CI)
			Achieved targetn (%)	Not achieved target n (%)		
Triglycerid	High > 2.2 mmol/l	135(36.4)	15(11.1)	120(88.9)	0.005	1
	Near high 1.7-2.2 mmol/l	55(14.8)	13(23.6)	42(76.4)		0.4 (0.18-0.91)
	Normal < 1.7 mmol/l	181(48.8)	46(25.4)	135(74.6)		0.37 (0.20-0.70)

The cholesterol and triglyceride levels have a statistically significant relationship with HbA1c control ( $p < 0.05$ ). Normal and near-high cholesterol values help reduce the risk of not achieving the HbA1c control target compared to the high cholesterol group (OR = 0.24; 0.07-0.79 and OR = 0.19; 0.05-0.69). Similarly, normal and near-high triglyceride values reduce the risk of not achieving the HbA1c control target compared to the high triglyceride group (OR = 0.37; 0.20-0.70 and OR = 0.4; 0.18-0.91). The confidence intervals do not include the value of 1, indicating that these relationships are statistically significant.

#### IV. DISCUSSION

##### Gender and Age of Study Subjects

The study results show that the proportion of males in the study group is 55.8%, higher than females (44.2%). This difference is statistically significant ( $p = 0.026$ ), indicating that males have a higher incidence of type 2 diabetes than females. This finding is consistent with many previous studies, which have pointed out that males tend to develop type 2 diabetes earlier than females, especially in middle-aged and older age groups [3].

Regarding age, the group of patients aged 65 and above has the highest proportion (36.6%), followed by the 50-64 years group (28.8%). The group under 50 years has the lowest proportion (7.6%). This reflects the increasing trend of type 2 diabetes among the elderly, which is a growing health issue in Vietnam and many other countries. According to an IDF study (2021), the incidence of diabetes in individuals over 65 years old is rising, with an estimated 60% of diabetes patients falling into this age group [4].

##### Lifestyle and Treatment

The results show that 68.5% of patients adhere to a good diet regimen; however, adherence to exercise is still relatively low, with only 46.6% of patients exercising regularly. This suggests that physical exercise has not been adequately emphasized by diabetes patients, even though it is an essential factor in HbA1c control and reducing complications.

According to Diabetes Care Journal (2020) [5], combining a proper diet and regular exercise can help reduce the risk of complications from type 2 diabetes and improve blood glucose control [5]. Regarding treatment, 81.4% of patients adhere well to the treatment regimen, which is quite high, indicating that most patients are well aware of the importance of following the prescribed treatment. However, the rate of insulin use (31.5%) and the use of combined insulin and oral medication (27.2%) shows that most patients are still relying on oral medication alone. This may reflect a dependence on oral medications until the disease progresses further.

##### Diet and Smoking Habits

Patients who adhere to a good diet regimen have a better rate of HbA1c control (OR = 0.25). However, smoking remains prevalent in the study group, with 16.2% of patients currently smoking. Smoking is known to be a major risk factor for complications of diabetes, particularly cardiovascular and neurological diseases. A study by Williams et al. (2019) [6] indicated that quitting smoking significantly improves blood glucose control and reduces the risk of complications for diabetes patients [6].

##### Conclusion

The results reflect the general trend that type 2 diabetes is increasing among the elderly, especially

males. Factors such as diet and treatment adherence play a significant role in HbA1c control.

**Recommendations:**

Factors such as lack of physical exercise, smoking habits, unhealthy diet, alcohol consumption, and irregular treatment adherence remain areas that need improvement to enhance the quality of treatment and disease control.

**REFERENCES**

- 1. Duong Thi Mai Phuong et al. (2022)**, "Status of blood glucose control and related factors in patients with type 2 diabetes at the National Hospital of Endocrinology in 2022", Vietnam Medical Journal, 527(1), p. DOI: <https://doi.org/10.51298/vmj.v527i1.5704>.
- 2. Diab Care Asia Study Group., (2015)**, "DiabCare Asia 2015: The status of diabetes care in Asian countries". , Diabetes Care. 38(1), pp. 34-42.
- 3. Tran Thi Minh Anh, (2022)**, "The status of HbA1c control in patients with diabetes mellitus at Vietnamese hospitals", Vietnam Medical Journal, 30(4), pp. 123-130.
- 4. International Diabetes Federation (IDF)., (2021)**, "IDF Diabetes Atlas 10th edition", <https://www.idf.org/>
- 5. American Diabetes Association, (2020)**, "Standards of Medical Care in Diabetes-2020", Diabetes Care. 43(1), pp. S66-S76.
- 6. Williams, K., Thompson, J., & Lee, M. (2019)**, "Impact of Smoking Cessation on Diabetes Control: A Review of Recent Studies", Journal of Diabetes Care. 42(5), pp. 761-769.