doi:10.2478/enr-2026-0002

Prevalence and predictors of poor glycemic control in patients with type 2 diabetes mellitus attending Alexandria Main University Hospital

Heba S. Kassab, Fathy Z. Alsewy, Sherif M. Abdelaziz, Reem M. Fathalla

Department of Internal Medicine, Diabetes and Metabolism Unit, Faculty of Medicine, Alexandria University, Alexandria, Egypt
E-mail: heba.kassab@alexmed.edu.eg

Objective. Despite the advances in diabetes management, there is still a high prevalence of poor glycemic control worldwide. This study aimed to determine the prevalence and predictors of poor glycemic control among patients with type 2 diabetes mellitus (T2DM) attending the outpatient clinic at Alexandria Main University Hospital (AMUH) Egypt.

Methods. This cross-sectional study was conducted on 290 patients with T2DM. Data were collected on sociodemographic factors, medical history, comorbidities, lifestyle behaviors, medication adherence, and biochemical measures. Statistical analyses including correlation and regression models were used to explore the relationships between various factors and glycemic control.

Results. The study revealed that 82.8% of participants had uncontrolled diabetes. Poor glycemic control was significantly associated with older age, lower education, rural residence, unemployment, and lower income. Additionally, patients with uncontrolled diabetes had higher rates of hypertension, dyslipidemia, ischemic heart disease, and diabetic peripheral neuropathy. Better physical activity and dietary adherence were linked to improved glycemic control, while medication adherence was significantly lower in the uncontrolled group. Among the significant predictors, physical activity (ORs=116.6–575.8) was the strongest predictor of improved diabetes control. Moreover, medication adherence (OR=4.098) and higher education (OR=8.354) were strongly associated with better diabetes control.

Conclusions. Socioeconomic factors, lifestyle behaviors, and medication adherence are key predictors of glycemic control in T2DM patients. Physical activity, medication adherence, and higher education were the strongest predictors of better glycemic control. Addressing these factors through targeted interventions, particularly in rural areas, is crucial for improving diabetes management and reducing the related complications.

Keywords: type 2 diabetes mellitus, glycemic control, medication adherence, physical activity, socioeconomic factors

Diabetes mellitus (DM) is a significant global health concern. It is one of the leading causes of mortality and disability globally impacting individuals across all the age groups and genders (Hossain et al. 2024).

The chronic effects of high blood glucose levels are associated with a long-term damage to various organs (Giri et al. 2018). The global prevalence of diabetes is steadily increasing with around 80% of individuals with diabetes residing in low- and middle-income countries (Holt 2018).

The glycemic control is generally considered to be good when the hemoglobin A1c (HbA1c)

Corresponding author: Heba S Kassab, Assistant Professor of Internal Medicine, Diabetes and Metabolism Unit, Faculty of Medicine, Alexandria University, 17 Champollion Street, El Messallah, Alexandria, Egypt, postcode 21131; phone: +20-100553687; e-mail: heba.kassab@alexmed.edu.eg.

level is 7% or lower over the past three months or an average of three consecutive fasting plasma glucose (FPG) measurements between 80 and 130 mg/dL. Although HbA1c is considered to be the best indicator of diabetes monitoring, it has many problems in Egypt including lack of standardization in different laboratories, higher cost, and the presence of many influencing factors like anemia or hemoglobinopathies leading to variable results. FPG is a good indicator of a short-term diabetes control follow up and could be self-administered as encouraged by guidelines (self-monitoring of blood glucose). Achieving and maintaining good glycemic control is crucial in preventing or delaying the onset of diabetes-related complications (Bin Rakhis 2022).

Factors influencing glycemic control often represents a combination of modifiable and non-modifiable aspects. These factors include sociodemographic variables such as gender, age, income, occupation, and education, as well as lifestyle elements like physical activity, dietary habits, and obesity. Additionally, a patient's diabetes-related history such as the age at diagnosis, duration of diabetes, type of treatment, and presence of complications or a family history of diabetes can impact the glycemic control (Yahaya et al. 2023).

Various factors contribute to the high prevalence of diabetes in Egypt. These include genetic factors, lifestyle behaviors such as physical inactivity and poor dietary habits, and the ongoing trend of urbanization. The increasing consumption of processed foods, sugary beverages, and fast foods has exacerbated the situation. Additionally, low levels of diabetes awareness inadequate access to healthcare and the high cost of diabetes medications and testing supplies present significant challenges in managing and controlling the disease (Abouzid et al. 2022).

Improper glycemic control in individuals with T2DM is a critical public health issue as it significantly contributes to the development and progression of complications. The primary goal of diabetes management is to maintain blood glucose levels within a healthy range to prevent complications. However, achieving and maintaining the optimal glycemic control over the long term can be particularly challenging for patients with T2DM due to the numerous factors involved. These factors may be influenced by both healthcare providers and the patients themselves, moreover, a poor glycemic control is often associated with other comorbid conditions such as metabolic syndrome, hypertension, abnormal high-density lipoprotein cholesterol (HDL-C) levels, and elevated triglycerides (Koro et al. 2004).

Material and Methods

Subjects. This study was conducted at Alexandria Main University Hospital in Alexandria Egypt using a cross-sectional analytical design. The research included 290 individuals diagnosed with T2DM who attended the DM outpatient clinic at the hospital and provided written informed consent. The study was approved by the ethical committee of Faculty of Medicine Alexandria University. It was conducted in accordance with Helsinki declaration and its amendments.

Participants were selected based on specific criteria including age more than 20 years and diagnosed with T2DM. Exclusion criteria included severe illness, advanced renal or liver diseases, and severe anemia. A comprehensive history was taken from each patient covering sociodemographic details such as age, gender, smoking, marital status (single, married, divorced, widow), education level, income (less than 5000 EGP, 5000–10000 EGP, more than 10000 EGP per month), family history of T2DM, comorbidities (e.g., hypertension and dyslipidemia), and the presence of complications such as diabetic kidney disease, diabetic retinopathy, and diabetic peripheral neuropathy.

Parameters examined. Lifestyle factors, such as smoking, physical activity, and dietary adherence, were assessed using standardized questionnaires. Physical activity was categorized according to Colberg et al. (2016) into three levels: mild (less than 30 min/day), moderate (30–45 min/day), and vigorous (greater than 45 min/day). Medication adherence was measured using the Arabic version of Morisky Green Levine (MGL) adherence scale (Morisky et al. 1986). Dietary adherence was evaluated using a questionnaire adapted from Alhariri et al. (2017). The questionnaire included ten closed-ended questions assessing patients' adherence to prescribed diets in the month preceding the study. Responses were scored on a Likert scale from 0 to 20 with scores categorized as: good adherence: 15–20, partial adherence: 10–15, and non-adherence below 10 (Alhariri et al. 2017).

Clinical examinations included blood pressure measurement, waist circumference, and body mass index (BMI). Fundus examination was performed to diagnose diabetic retinopathy. Neurological examination was done to diagnose diabetic peripheral neuropathy. Blood samples were collected for biochemical tests including serum cholesterol, triglycerides, and FPG. Patients were considered to have a poor glycemic control if their mean FPG of three consecutive measures was greater than 130 mg/dL or less than 80 mg/dL. Ischemic heart disease was diagnosed either by history of previous ischemic events or the presence of symptoms suggesting ischemia and confirmed by further investigations (resting or stress ECG or coronary angiography as indicated) as required by guidelines. Diabetic kidney disease was diagnosed by decline in estimated glomerular filtration rate below 60 ml/min/1.73m^2 and/or persistent albuminuria measured by repeated urinary albumin to creatinine ratio ≥30 mg/g.

Statistical analysis. Data were fed to the computer and analyzed using IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. Shapiro-Wilk test was used to verify the normality of distribution. Quantitative data were described using mean and standard deviation (SD). Significance of the obtained results was judged at the 5% level. The used tests were Spearman coefficient to correlate between two abnormally distributed quantitative variables, Chi-square test for categorical variables to compare between different groups, Mann Whitney test for non-normally distributed quantitative variables to compare between two studied groups, and Kruskal Wallis test for non-normally distributed quantitative variables to compare between more than two studied groups. Pearson's correlation analysis was performed to examine the relationship between FPG and continuous variables. Multiple regression models were developed and the most suitable model was selected based on its accuracy and interpretability. This model identified key intervention areas including exercise, medication adherence, and diet, while highlighting smoking cessation, BMI control, and lipid management as critical factors. The analysis also emphasized the importance of rural healthcare access and cardiovascular risk management in achieving effective diabetes control.

Results

The data indicate that out of 290 cases studied, only 50 cases (17.2%) had controlled diabetes, while the majority, 240 cases (82.8%), had uncontrolled diabetes. Uncontrolled diabetes was significantly associated with older age (mean 52.91±11.78 years vs. 48.0±12.89 years, p=0.009), lower education levels (illiterate represent 25.8% among uncontrolled DM vs. 10% among controlled, p=0.007), rural residence (39.6% vs. 24%, p=0.038), unemployment (56.7% vs. 38%, p=0.016), and lower income (53.8% vs. 38%, p=0.006), while non-significant difference was found regarding marital state (p=0.06). Higher percentage of uncontrolled were widows (22.1% vs. 10%).

Comparison between controlled and uncontrolled groups regarding comorbidities and complications

Table 1
Comparison between controlled and uncontrolled groups regarding adherence to follow up, antidiabetic medications, and medication adherence

Variable	Total (n=290)		Controlled (n=50)		Uncontrolled (n=240)		p-value
	No.	%	No.	%	No.	%	
Adherence to follow up							
At least once per month	123	42.4	21	42.0	102	42.5	0.948
Less than once per month	167	57.6	29	58.0	138	57.5	
Anti-diabetic medication							
Oral	152	52.4	24	48.0	128	53.3	0.424
Insulin	92	31.7	15	30.0	77	32.1	
Oral + insulin	46	15.9	11	22.0	35	14.6	
Medication adherence							
Low (3–4)	66	22.8	1	2.0	65	27.1	<0.001*
Moderate (1–2)	155	53.4	29	58.0	126	52.5	
High (0)	69	23.8	20	40.0	49	20.4	
Adherence score							
Min–Max	0.0–4.0		0.0–4.0		0.0–4.0		<0.001*
Mean±SD	1.83±1.34		1.08±1.01		1.98±1.35		

Abbreviations: Min – Minimum; Max – Maximum; SD – Standard deviation. *Statistically significant at p≤0.05.

Table 2
Comparison between controlled and uncontrolled groups regarding physical activity and dietary adherence

Variable	Total (n=290)		Controlled (n=50)		Uncontrolled (n=240)		p-value
	No.	%	No.	%	No.	%	
Physical activity (min per day)							
Inactive	52	17.9	10	20.0	42	17.5	0.004*
Mild (<30)	81	27.9	7	14.0	74	30.8	
Moderate (30–45)	88	30.3	12	24.0	76	31.7	
Vigorous (>45)	69	23.8	21	42.0	48	20.0	
Dietary adherence							
No (<10)	69	23.8	0	0.0	69	28.8	<0.001*
Partial (10–14)	181	62.4	33	66.0	148	61.7	
Good (15–20)	40	13.8	17	34.0	23	9.6	
Diet adherence score							
Min–Max	4.0–20.0		10.0–19.0		4.0–20.0		0.001*
Mean±SD	11.95±3.43		13.64±2.36		11.60±3.52		

Abbreviations: Min – Minimum; Max – Maximum; SD – Standard deviation. *Statistically significant at p≤0.05.

Table 3
Correlation between fasting plasma glucose (FPG) and different parameters

Variable	FPG average	
	r_s	p-value
Gender	0.027	0.650
Family history of DM	0.131*	0.026
Residence	0.204**	0.000
Occupation	0.203**	0.001
Adherence to follow up	0.010	0.861
Marital status	0.063	0.283
Educational level	−0.235**	0.000
Income	−0.188**	0.001
Hypertension	0.167**	0.004
Dyslipidemia	0.070	0.233
Ischemic heart disease	0.296**	0.000
Diabetic kidney disease	0.144*	0.014
Diabetic retinopathy	0.160**	0.006
Peripheral neuropathy	0.252**	0.000
Smoking	−0.015	0.795

Abbreviations: DM – diabetes mellitus; FPG – fasting plasma glucose; r_s – Spearman coefficient. Statistically significant at p≤0.05.

revealed significant differences in terms of ischemic heart disease (2% among controlled vs. 27.9% uncontrolled, p<0.001) and diabetic peripheral neuropathy (36% vs. 71.7%, p<0.001). However, hypertension, dyslipidemia, smoking, family history of DM, and diabetes duration were equally prevalent in both groups with non-significant difference (p-value >0.05).

Table 1 reveals that medication adherence was significantly lower in the uncontrolled group with 27.1% having poor adherence compared to only 2% in the controlled group (p<0.001). The adherence score was also significantly lower in uncontrolled cases (p<0.001). On other hand, non-significant difference was found regarding the adherence to follow up and anti-diabetic medication (p>0.05).

Table 2 reveals that physical activity levels were significantly different between groups (p=0.004) with vigorous activity more common in the controlled group (42% vs. 20%), while a sedentary lifestyle was more prevalent in the uncontrolled group (30.8% vs. 14%) and dietary adherence was significantly better in the controlled group (p<0.001) with 34% following a good diet compared to only 9.6% in the uncontrolled group. The adherence score was also significantly lower in the uncontrolled group (p=0.001).

Correlation analysis between FPG and continuous variables revealed that FPG showed a statistically significant positive correlation with: age (r=0.230, p<0.001), diabetes duration (r=0.156, p=0.009), medication adherence (r=0.263, p<0.001), diastolic blood pressure (r=0.139, p=0.018), BMI (r=0.333, p<0.001), and serum triglycerides (r=0.270, p<0.001). However, FPG was negatively correlated with diet adherence (r=-0.192, p=0.001) and there was no significant correlation between FPG and systolic blood pressure, waist circumference, and serum cholesterol.

Table 3 shows correlation between FPG and the different variables.

A-socioeconomic and lifestyle factors: FPG was significantly higher in rural areas than urban areas dwellers and unemployed individuals (p<0.001). However, FPG was significantly lower in individuals with higher-income and individuals with higher education level (p=0.001).

B-medical conditions: FPG levels were significantly positively correlated with family history of diabetes (p=0.026), hypertension (p=0.004), ischemic heart disease (p<0.001), diabetic kidney disease (p=0.014), diabetic retinopathy (p<0.05), and diabetic peripheral neuropathy (p<0.001).

There was no significant correlation between FPG level and gender, adherence to follow-up, marital status, dyslipidemia, and smoking (p>0.05).

Table 4 shows logistic multivariate regression analysis for predictors of uncontrolled diabetes. Among the significant predictors, the physical activity (ORs=116.6–575.8) was the strongest predictor of improved diabetes control. Diet adherence (OR=0.457) and medication adherence (OR=4.098) also significantly improved diabetes control with better outcomes. Higher education (OR=8.354) is strongly associated with better diabetes control, but rural residence (OR=0.048), higher BMI, and low socioeconomic status are linked to lower likelihood of diabetes control.

Regarding comorbidities, especially dyslipidemia, elevated triglycerides (OR=1.043, p=0.005),

Table 4
Logistic multivariate regression analysis for predictors of uncontrolled diabetes

Variable	OR	p-value	Exp (OR)	95% CI for EXP (OR)	
				Lower	Upper
Residence (Rural)	–3.044	0.015*	0.048	0.004	0.556
Marital status (Not married)	1.099	0.210	3.000	0.538	16.729
Educational level (Higher)	2.123	0.034*	8.354	1.179	59.177
Hypertension	–4.206	0.014*	0.015	0.001	0.423
Ischemic heart disease	–8.126	0.005*	0.000	0.000	0.084
Diabetic peripheral neuropathy	–2.063	0.023*	0.127	0.022	0.749
Adherence to follow up (Less than once per month)	1.196	0.133	3.307	0.695	15.741
Antidiabetic medications (Oral)		0.124			
Antidiabetic medications (Insulin)	2.090	0.110	8.087	0.622	105.065
Antidiabetic medications (Oral+Insulin)	0.061	0.962	1.063	0.085	13.285
Medication Adherence Score	1.410	0.001*	4.098	1.745	9.624
Smoking (Smoker)	–2.776	0.009*	0.062	0.008	0.501
Physical activity (inactive)		0.002*			
Physical activity (<30 min/day)	6.356	0.001*	575.846	15.677	21151.911
Physical activity (30–45 min/day)	4.758	0.001*	116.565	7.208	1884.951
Physical activity (>45 min/day)	4.928	0.001*	138.112	7.005	2723.091
Diet Adherence Score	–0.783	0.000*	0.457	0.304	0.687
Systolic blood pressure	–0.127	0.015*	0.881	0.795	0.975
Diastolic blood pressure	–0.082	0.161	0.921	0.822	1.033
BMI	0.896	0.000*	2.450	1.589	3.777
Serum cholesterol (mg/dl)	–0.077	0.000*	0.926	0.889	0.965
Serum triglycerides (mg/dl)	0.042	0.005*	1.043	1.012	1.074
Constant	28.280	0.003*	1912877670971.530		

Abbreviations: BMI – body mass index; CI – Confidence interval; Max – Maximum; Min – Minimum; OR – Odd`s ratio; SD – standard deviation. Statistically significant at p≤0.05.

hypertension and ischemic heart disease with OR=0.015 and OR=0.000, respectively, were associated with high risk for uncontrolled diabetes. Diabetic peripheral neuropathy (OR=0.127) was the most significant complication associated with poorer control outcomes.

Non-significant predictors included age, gender, diabetes duration, family history of diabetes, occupation, diabetic kidney disease, diabetic retinopathy, smoking, marital status, and income level.

Discussion

The present study underscores the considerable challenge of maintaining regulated blood glucose levels in individuals with T2DM as 82.8% of participants were found to have poorly controlled diabetes. Similarly, Khattab et al. (2023) have found that only 18.4% of studied participants achieved good glycemic control (HbA1c<7%). Although this study included patients from all over Egypt recruited from private clinics and they used HbA1c for defining diabetes control yet, the prevalence of uncontrolled cases was very high and comparable to the results of the present study. This makes measuring the glycemic control through either HbA1c or repeated FPG measurement comparable in assessing glycemic control in our country. These findings highlight the magnitude of the problem of uncontrolled diabetes in Egypt requiring urgent actions (Khattab et al. 2023).

This finding calls into question previous reports on the prevalence of diabetes across various countries and highlights the urgent need for enhanced diabetes care strategies. Similar to the present study, Saghir et al. (2024) have reported that 73.2% of patients withT2DM in Yemen had inadequate glycemic control. This reinforces the public health concern surrounding this issue. Both studies emphasize the importance of economic and educational disparities in diabetes care with factors such as unemployment, low education levels, and financial constraints being significant contributors to poor diabetes outcomes (Saghir et al. 2024).

While the rate of poor glycemic control in our study was 82.8%, Alzaheb and Altemani (2018) have observed a lower percentage in Saudi Arabia which was 56.8%. A closer estimate to our findings was observed by Phuwilert et al. (2024) in Thailand, where 79.74% of T2DM patients had inadequate glycemic control. Similar to Egypt, Thailand's findings pointed to low income, limited education, and rural residency as key predictors of poor glycemic control.

The current study highlights the role of socioeconomic factors in diabetes management demonstrating that poor glycemic control was strongly associated with older age, lower education levels, rural residency, unemployment, and lower income. Consistent with other studies, we found a significant positive correlation between age and FPG levels. Additionally, there was a negative correlation between FPG and both education level and income level suggesting that individuals with higher education and income levels tend to have better glycemic control. These individuals may benefit from greater healthcare access, increased health awareness, and better self-management practices.

Our findings on the influence of aging on diabetes control are consistent with studies conducted in other countries. For instance, Mascarenhas e Dias et al. (2025) have reported that 61.8% of participants were aged 60 years or older highlighting the greater risk of poor glycemic control among older populations.

Higher levels of education have been associated with improved glycemic control as our study identified a significant negative correlation between education level and FPG. This finding aligns with that of Saghir et al. (2024) who have found that individuals without formal education were more likely to experience poor glycemic control.

These results reinforce the idea that financial insecurity and lack of health insurance contribute to inadequate diabetes management. Unemployment was also significantly associated with poor glycemic control. Similarly, Mascarenhas e Dias et al. (2025) have found that 63.1% of their study participants were unemployed, underscoring the importance of employment status as a determinant of healthcare access, medication affordability, and overall diabetes self-care.

Our study also emphasizes the crucial role of medication adherence in managing diabetes. The rate of medication adherence was significantly lower in the group with poor glycemic control (27.1%) compared to the control group (2%). In line with these findings, Phuwilert et al. (2024) have demonstrated that better medication adherence is strongly associated with improved glycemic control outcomes. In their study, patients with poor adherence had significantly lower adherence scores (mean=1.59±0.90) compared to those with controlled blood glucose levels.

Important lifestyle factors such as regular physical activity and adherence to a healthy diet also significantly contributed to glycemic control. Our study found that patients with better diabetes management were more likely to engage in physical activity and adhere to their diet. Physical activity was the strongest predictor of glycemic control. This highlights its crucial role as a corner stone component in diabetes management. Phuwilert et al. (2024) have found that poor dietary adherence increased the likelihood of poor glycemic control by 6.12 times, which aligns with our results.

Dyslipidemia and poor glycemic control were further confirmed by biochemical markers. In the group with uncontrolled diabetes, we observed significantly higher levels of fasting triglyceride levels. Azagew et al. (2024) have found a strong correlation between dyslipidemia and poor glycemic control, which is consistent with our findings. Logistic regression analysis further supported the notion that dyslipidemia is a significant predictor of poor glycemic outcomes, as it was identified as a key factor.

Conclusion. Socioeconomic factors, lifestyle behaviors, and medication adherence are key predictors of glycemic control in T2DM patients. Physical activity, medication adherence, and higher education were the strongest predictors of better glycemic control. Addressing these factors through targeted interventions particularly in rural areas, is crucial for improving diabetes management and reducing related complications. However, the study has some limitations including single center design and not including HbA1c in assessment of glycemic control. Further studies are needed to address these limitations.

Acknowledgment

We would like to acknowledge Diabetes and Metabolism Unit, Internal Medicine Department, Faculty of Medicine, Alexandria University where the work was done.

Conflicts of interest: *Authors declare no conflicts of interest.*

References

Abouzid MR, Ali K, Elkhawas I, Elshafei SM. An overview of diabetes mellitus in Egypt and the significance of integrating preventive cardiology in diabetes management. Cureus 14, e27066, 2022.

Alhariri A, Daud F, Almaiman A, Saghir S. Factors associated with adherence to diet and exercise among type 2 diabetes patients in Hodeidah city, Yemen. Life 7, 264–271, 2017.

Alzaheb RA, Altemani AH. The prevalence and determinants of poor glycemic control among adults with type 2 diabetes mellitus in Saudi Arabia. Diabetes Metab Syndr Obes 11, 15–21, 2018.

Azagew AW, Abate HK, Mekonnen CK, Mekonnen HS, Tezera ZB, Jember G. Diabetic dyslipidemia and its predictors among people with diabetes in Ethiopia: systematic review and meta-analysis. Syst Rev 13, 190–193, 2024.

Bin Rakhis SA Sr, AlDuwayhis NM, Aleid N, AlBarrak AN, Aloraini AA. Glycemic control for type 2 diabetes mellitus patients: a systematic review. Cureus 14, e26180, 2022.

Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, Horton ES, Castorino K, Tate DF. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. Diabetes Care 39, 2065–2079, 2016.

Giri B, Dey S, Das T, Sarkar M, Banerjee J, Dash SK. Chronic hyperglycemia mediated physiological alteration and metabolic distortion leads to organ dysfunction, infection, cancer progression and other pathophysiological consequences: An update on glucose toxicity. Biomed Pharmacother 107, 306–328, 2018.

Holt RIG. Psychosocial impact of diabetes. Diabet Med 35, 675–676, 2018.

Hossain MJ, Al-Mamun M, Islam MR. Diabetes mellitus, the fastest growing global public health concern: Early detection should be focused. Health Sci Rep 7, e2004, 2024.

Khattab M, Assaad-Khalil S, Elibrashy I, Khalifa A, Amara F, Elgayyar H, Elkafrawy N, George S, Ghanem Y, Hafez S, Shereiba N. Control and treatment of type 2 diabetes in private patients in the Egyptian "DIACONTROL study". Eur Rev Med Pharmacol Sci 27, 11421–11432, 2023.

Koro CE, Bowlin SJ, Bourgeois N, Fedder DO. Glycemic control from 1988 to 2000 among U.S. adults diagnosed with type 2 diabetes: a preliminary report. Diabetes Care 27, 17–20, 2004.

Mascarenhas e Dias NC, Kamble VU, Cacodcar JA. Poor glycemic control and its determinants in patients with type 2 diabetes mellitus taking treatment at an Urban Health and Training Center in Goa: a cross-sectional study. Medical Journal of Dr. D.Y. Patil Vidyapeeth 18, 46–51, 2025.

Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care24, 67–74,1986.

Phuwilert P, Khiewkhern S, Phajan T, Wongprachum K, Wibuloutai J, Srichomphoo C, Nghiep LK, Tudpor K. Factors affecting glycemic control in patients with type 2 diabetes in Kalasin province, Thailand: an analytical cross-sectional study. Healthcare (Basel) 12, 1916, 2024.

Saghir SA, Hossain MJ, Al-Mamun M, Islam MR. Diabetes mellitus, the fastest growing global public health concern: Early detection should be focused. Health Sci Rep 7, 20–26, 2024.

Yahaya JJ, Doya IF, Morgan ED, Ngaiza AI, Bintabara D. Poor glycemic control and associated factors among patients with type 2 diabetes mellitus: a cross-sectional study. Sci Rep 13, 9673, 2023.