Section: Miscellaneous

Original Research Article

STUDY ON THE IMPACT OF EARLY GLYCEMIC CONTROL IN NEWLY DIAGNOSED TYPE 2 DIABETES MELLITUS PATIENTS

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is a progressive disease characterized by insulin resistance, impaired insulin secretion, and chronic hyperglycemia. Achieving early glycemic control in newly diagnosed patients is crucial for improving metabolic outcomes and reducing the risk of long-term complications. The aim is to assess the impact of early glycemic control on metabolic parameters and early diabetes-related complications in newly diagnosed T2DM patients.

Materials and Methods: This prospective, observational study was conducted at a tertiary care teaching hospital and included 130 newly diagnosed T2DM patients aged 30–65 years. Participants were managed with standardized lifestyle modifications and pharmacologic therapy to achieve glycemic targets. Patients were categorized into Group A (HbA1c <7% at 6 months) and Group B (HbA1c ≥7% at 6 months). Baseline and follow-up measurements of fasting plasma glucose (FPG), postprandial glucose (PPG), HbA1c, lipid profile, blood pressure, BMI, and diabetes-related complications were recorded and compared between groups.

Results: Out of 130 participants, 76 (58.46%) achieved early glycemic control, while 54 (41.54%) did not. Group A demonstrated significantly lower FPG (102.4 ± 18.5 mg/dL vs 142.7 ± 25.3 mg/dL, p<0.001), PPG (148.9 ± 27.6 mg/dL vs 206.3 ± 41.2 mg/dL, p<0.001), HbA1c (6.4 ± 0.3% vs 8.1 ± 0.7%, p<0.001), BMI, systolic blood pressure, and LDL cholesterol compared to Group B. The incidence of neuropathy (5.3% vs 16.7%, p=0.034) and microalbuminuria (7.9% vs 20.4%, p=0.041) was significantly lower in Group A, while retinopathy rates did not differ significantly.

Conclusion: Early glycemic control in newly diagnosed T2DM patients leads to significant improvement in metabolic parameters and reduces the risk of early microvascular complications. Prompt and intensive management strategies at diagnosis are essential to improve long-term outcomes and disease prognosis.

Keywords: Type 2 Diabetes Mellitus, Early Glycemic Control, HbA1c, Microvascular Complications, Metabolic Parameters.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a complex, progressive metabolic disorder characterized by insulin resistance, impaired insulin secretion, and chronic hyperglycemia. Over recent decades, it has emerged as a major global health burden, affecting millions of individuals and significantly contributing to morbidity and mortality rates worldwide. Early glycemic control in newly diagnosed patients plays a critical role not only in improving immediate metabolic outcomes but also in preventing or delaying the onset of long-term complications. Current research emphasizes that early intervention

can have a profound and lasting impact on the trajectory of T2DM progression, influencing cardiovascular, renal, and microvascular outcomes. In the evolving landscape of diabetes management, it is increasingly recognized that aggressive early treatment strategies targeting glycemic control can modify disease progression. Traditionally, therapeutic inertia and delayed intensification of treatment have contributed to prolonged periods of uncontrolled hyperglycemia, leading to a heightened risk of complications. The emerging paradigm suggests that early normalization of glucose levels, often referred to as the "metabolic memory" or "legacy effect," can induce favorable long-term clinical outcomes even if glycemic control later deteriorates. This concept has prompted a re-evaluation of treatment approaches in newly diagnosed patients, moving towards more proactive and individualized management strategies. Several mechanisms have been proposed to explain the profound benefits of early glycemic control. Recent insights point towards nutrient deprivation signaling and autophagy activation as pivotal pathways through which interventions such as SGLT2 inhibitors and intensive glucose lowering exert their cardiorenal protective effects.[1] Thus, early glycemic control is not solely about achieving numerical targets but also about modulating underlying pathogenic mechanisms that perpetuate beta-cell dysfunction, insulin resistance, and vascular injury.

Despite a better understanding of T2DM pathophysiology, achieving optimal glycemic control remains a major challenge in clinical practice. Studies examining baseline quality of care have shown considerable gaps in the timely initiation and intensification of therapy among newly diagnosed individuals.[2] Early monotherapy with agents like metformin has been the traditional first-line strategy; however, emerging evidence advocates for the initiation of combination therapy in certain cases to achieve faster and more durable glycemic responses.[3] Initiating treatment aggressively from the outset appears to have the potential to reduce the burden of cardiovascular disease, one of the leading causes of death among patients with diabetes.[4]

The urgency of achieving early glycemic control is particularly evident in younger populations. The TODAY study revealed that youth-onset T2DM is associated with a significantly higher risk of early-onset complications compared to adult-onset disease.[5] These findings underscore the importance of prompt and effective glycemic management in younger patients to mitigate the risks of retinopathy, nephropathy, neuropathy, and cardiovascular disease. Similar concerns were raised by the RISE Consortium, which highlighted that youth with impaired glucose tolerance or early T2DM exhibit more rapid deterioration of beta-cell function compared to adults.[6,7]

The pathophysiological differences between youth and adults with T2DM also extend to metabolic responses to interventions. Youth display lower insulin sensitivity, distinct glucose response curves during oral glucose tolerance tests, and impaired beta-cell compensation compared to adults.[8] Observations from hyperglycemic clamp studies revealed that youth with impaired glucose tolerance or recent T2DM show significantly worse beta-cell function compared to adults at baseline.[9] These physiological differences contribute to the accelerated disease course seen in younger populations, reinforcing the need for early and aggressive treatment.

Determinants of glycemic control in newly diagnosed youth have been explored extensively, with studies identifying factors such as adherence to therapy, baseline HbA1c, beta-cell function, and insulin sensitivity as crucial predictors of long-term success.[10] These determinants are equally applicable to adults, suggesting that early intervention strategies tailored to the individual's clinical and metabolic profile are critical for achieving durable glycemic control. Moreover, the success of early intervention strategies hinges not only on pharmacologic therapy but also on comprehensive lifestyle modification programs focusing on diet, physical activity, and weight management. Addressing these modifiable risk factors early in the course of the disease can enhance the effectiveness of pharmacologic treatments and contribute to sustained glycemic improvements. Thus, this study was designed to evaluate the impact of early glycemic control in newly diagnosed T2DM patients, with a focus on assessing metabolic outcomes and early complications within six months of diagnosis. By prospectively following patients categorized based on achievement of glycemic targets, this study aims to contribute to the growing body of evidence supporting early intensive management strategies in T2DM.

MATERIALS AND METHODS

This prospective, observational study was conducted at a tertiary care teaching hospital, following approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment. A total of 130 patients were consecutively recruited from the outpatient department. All participants were newly diagnosed cases of Type 2 Diabetes Mellitus (T2DM), defined according to the American Diabetes Association (ADA) 2024 criteria.

Inclusion Criteria

- Adults aged 30–65 years.
- Newly diagnosed with T2DM (within the past 6 months).
- Baseline HbA1c ≥6.5% at diagnosis.
- Willingness to participate and provide informed consent.
- Ability to adhere to follow-up visits and study protocol.

Exclusion Criteria

- History of prior diagnosis or treatment for diabetes mellitus.
- Presence of Type 1 Diabetes Mellitus or secondary causes of diabetes (e.g., pancreatitis, steroid-induced diabetes).
- Severe comorbid conditions (e.g., end-stage renal disease, malignancy, chronic liver disease).
- Pregnant or lactating women.
- Patients on medications known to significantly impact glucose metabolism (e.g., corticosteroids).
- Inability or unwillingness to comply with study procedures.

Methodology: Participants were subjected to a standardized management protocol aimed at achieving early glycemic control within the first 6 months of diagnosis. They were counseled for lifestyle modifications, including dietary changes, exercise regimens, and medication adherence, according to standard guidelines. Pharmacologic therapy was initiated based on the initial HbA1c levels and glycemic targets.

Participants were categorized based on achievement of early glycemic control:

- Group A (Early Glycemic Control Achieved): HbA1c <7% within 6 months.
- Group B (Early Glycemic Control Not Achieved): HbA1c ≥7% at 6 months.

Baseline demographic information including age, gender, body mass index (BMI), family history of diabetes, and smoking status was recorded for all participants. Clinical parameters such as blood pressure and waist circumference were also documented at enrollment. Laboratory investigations performed at baseline included fasting plasma glucose (FPG), postprandial plasma glucose (PPG), glycated hemoglobin (HbA1c), lipid profile, serum creatinine, and liver function tests. These investigations were subsequently repeated at 3 months and 6 months to monitor progress. In addition, detailed data regarding medication usage, adherence to prescribed lifestyle modifications, and the occurrence of any adverse events were collected during follow-up visits at regular intervals. The primary outcome of the study was the proportion of patients achieving early glycemic control, defined as an HbA1c level of less than 7% at the end of 6 months. Secondary outcomes included the evaluation of changes in FPG, PPG, and HbA1c over time; the impact of early glycemic control on lipid profile, blood pressure, and BMI; and the incidence of early diabetes-related complications such as neuropathy and retinopathy based on screening assessments.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the Student's t-test or Mann-Whitney U test, as appropriate. Categorical variables were expressed as numbers and percentages, and compared using the Chi-square test or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

RESULTS

Baseline Demographic and Clinical Characteristics: The study enrolled a total of 130 newly diagnosed Type 2 Diabetes Mellitus (T2DM) patients, with a mean age of 48.7 ± 8.6 years. The majority of the participants were male, accounting for 60% (n=78), while females constituted 40% (n=52) of the study population. The mean body mass index (BMI) recorded was 28.4 ± 3.7 kg/m², indicating that most participants were overweight or obese at baseline. A positive family history of diabetes was present in 63.8% (n=83) of the participants, suggesting a strong genetic predisposition in the study group. Regarding smoking status, 24.6% (n=32) of participants were current smokers. The mean waist circumference was 94.3 ± 8.1 cm, further indicating central obesity, a known risk factor for T2DM. The mean systolic and diastolic blood pressures were 132.5 ± 12.4 mmHg and 84.2 ± 8.3 mmHg, respectively, suggesting a tendency towards pre-hypertension or hypertension among participants at diagnosis [Table 1].

Baseline Laboratory Parameters: At baseline, the mean fasting plasma glucose (FPG) level was markedly elevated at 168.2 ± 34.5 mg/dL, and the postprandial plasma glucose (PPG) was significantly high at 252.7 ± 46.2 mg/dL. The mean HbA1c at diagnosis was 8.7 ± 1.2%, confirming poor glycemic control at the time of enrollment. The lipid profile demonstrated a mean total cholesterol level of 198.5 ± 34.1 mg/dL, with a mean LDL cholesterol level of 123.8 ± 27.4 mg/dL and HDL cholesterol at a lower mean value of 42.5 ± 8.6 mg/dL, suggesting a dyslipidemic profile. The mean triglyceride level was 175.4 ± 52.1 mg/dL, again reflecting common metabolic disturbances associated with diabetes. The mean serum creatinine level was within the normal range at 0.9 ± 0.2 mg/dL, indicating preserved renal function at baseline [Table 2].

Glycemic Control Status at 6 Months: After six months of standardized management, 76 patients (58.46%) achieved early glycemic control, defined as HbA1c <7% (Group A), while 54 patients (41.54%) failed to reach this target and remained in Group B (HbA1c ≥7%). This highlights that with early intervention and strict adherence to therapy, a significant proportion of newly diagnosed patients could attain recommended glycemic targets within the initial months of diagnosis [Table 3].

Comparison of Glycemic and Metabolic Parameters between Group A and Group B: When comparing glycemic parameters at the end of six months, Group A patients showed significantly lower fasting plasma glucose (102.4 ± 18.5 mg/dL) compared to Group B (142.7 ± 25.3 mg/dL) with a p-value <0.001, indicating a highly significant difference. Similarly, postprandial plasma glucose levels were substantially better controlled in Group A (148.9 ± 27.6 mg/dL) compared to Group B (206.3 ± 41.2 mg/dL) (p<0.001). The mean HbA1c was 6.4 ±

0.3% in Group A versus 8.1 ± 0.7% in Group B, a highly significant difference (p<0.001). Group A also demonstrated a lower mean BMI (27.9 ± 3.4 kg/m²) compared to Group B (29.2 ± 3.9 kg/m²), which was statistically significant (p=0.045). Additionally, systolic blood pressure was lower in Group A (128.2 ± 11.6 mmHg) than in Group B (135.4 ± 13.1 mmHg) with a p-value of 0.012. LDL cholesterol levels were also better controlled in Group A (116.5 ± 22.7 mg/dL) compared to Group B (132.1 ± 28.4 mg/dL), which was statistically significant (p=0.018) [Table 4].

Incidence of Early Diabetes-related Complications: The incidence of early diabetes-related complications was evaluated at the 6-month follow-up. Neuropathy was detected in 5.3% (n=4) of patients in Group A and 16.7% (n=9) of patients in Group B, with the difference being statistically significant (p=0.034). Retinopathy was detected in 2.6% (n=2) of Group A and 9.3% (n=5) of Group B patients, but this difference was not statistically significant (p=0.112). Microalbuminuria, an early marker of diabetic nephropathy, was observed in 7.9% (n=6) of Group A and 20.4% (n=11) of Group B, with a significant difference between groups (p=0.041). These findings suggest that achieving early glycemic control was associated with a lower incidence of microvascular complications within the first six months of diagnosis [Table 5].

Table 1: Baseline Demographic and Clinical Characteristics of Study Population (n = 130)

Parameter	Mean ± SD / n (%)
Age (years)	48.7 ± 8.6
Gender	Male: 78 (60%), Female: 52 (40%)
Body Mass Index (BMI, kg/m²)	28.4 ± 3.7
Family history of diabetes	83 (63.8%)
Smoking status (current smokers)	32 (24.6%)
Waist circumference (cm)	94.3 ± 8.1
Systolic Blood Pressure (mmHg)	132.5 ± 12.4
Diastolic Blood Pressure (mmHg)	84.2 ± 8.3

Table 2: Baseline Laboratory Parameters of Study Population.

Parameter	Mean ± SD
Fasting Plasma Glucose (mg/dL)	168.2 ± 34.5
Postprandial Plasma Glucose (mg/dL)	252.7 ± 46.2
Glycated Hemoglobin (HbA1c, %)	8.7 ± 1.2
Total Cholesterol (mg/dL)	198.5 ± 34.1
LDL Cholesterol (mg/dL)	123.8 ± 27.4
HDL Cholesterol (mg/dL)	42.5 ± 8.6
Triglycerides (mg/dL)	175.4 ± 52.1
Serum Creatinine (mg/dL)	0.9 ± 0.2

Table 3: Glycemic Control Status at 6 Months

Group	Number of Patients (n)	Percentage (%)
Group A (HbA1c <7%)	76	58.46%
Group B (HbA1c ≥7%)	54	41.54%

Table 4: Comparison of Glycemic and Metabolic Parameters between Group A and Group B at 6 Months

Parameter	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
FPG (mg/dL)	102.4 ± 18.5	142.7 ± 25.3	<0.001
PPG (mg/dL)	148.9 ± 27.6	206.3 ± 41.2	<0.001
HbA1c (%)	6.4 ± 0.3	8.1 ± 0.7	<0.001
BMI (kg/m²)	27.9 ± 3.4	29.2 ± 3.9	0.045
Systolic BP (mmHg)	128.2 ± 11.6	135.4 ± 13.1	0.012
LDL Cholesterol (mg/dL)	116.5 ± 22.7	132.1 ± 28.4	0.018

Table 5: Incidence of Early Diabetes-related Complications at 6 Months

Complication	Group A (n=76)	Group B (n=54)	p-value
Neuropathy detected (%)	4 (5.3%)	9 (16.7%)	0.034
Retinopathy detected (%)	2 (2.6%)	5 (9.3%)	0.112
Microalbuminuria (%)	6 (7.9%)	11 (20.4%)	0.041

DISCUSSION

The baseline characteristics of the study population revealed that a majority of patients were middle-aged, overweight, and had a positive family history of diabetes. In our study, the mean age was 48.7 ± 8.6 years, with 60% males and 40% females. This demographic profile is similar to that reported by Olson et al,[11] who also observed a high prevalence of overweight and obesity among newly diagnosed diabetic individuals. In our cohort, the mean BMI was 28.4 ± 3.7 kg/m², and 63.8% had a positive family history of diabetes, comparable to findings from Harris et al,[12] who emphasized genetic predisposition and central obesity as major risk factors for T2DM. The high waist circumference and

elevated blood pressure in our participants reflect a clustering of cardiovascular risk factors, similar to patterns described by Gregg et al,[13] in the U.S. diabetic population.

Baseline laboratory values in this study highlighted poor glycemic control and dyslipidemia at diagnosis, with a mean fasting plasma glucose of 168.2 ± 34.5 mg/dL, postprandial plasma glucose of 252.7 ± 46.2 mg/dL, and mean HbA1c of 8.7 ± 1.2%. These findings closely mirror those of Monnier et al,[14] who reported that early-stage diabetes is often associated with significant hyperglycemia and lipid abnormalities. The mean LDL cholesterol was 123.8 ± 27.4 mg/dL and HDL cholesterol was lower at 42.5 ± 8.6 mg/dL in our study, suggesting an atherogenic lipid profile consistent with the dysmetabolic state described by Blumenthal et al.[15]

At 6 months, our study demonstrated that 58.46% of patients (Group A) achieved early glycemic control (HbA1c <7%), while 41.54% (Group B) did not. This success rate is similar to the TODAY study results reported by Zeitler et al,[16] where approximately 50–60% of adolescents with newly diagnosed T2DM achieved initial glycemic targets on monotherapy with metformin. Furthermore, Laiteerapong et al,[17] highlighted the concept of a "legacy effect," suggesting that early and durable glycemic control significantly reduces future diabetes-related complications, supporting the importance of achieving early targets as observed in our study.

When comparing metabolic outcomes between the two groups at 6 months, Group A showed significantly better control of fasting plasma glucose (102.4 ± 18.5 mg/dL) and postprandial plasma glucose (148.9 ± 27.6 mg/dL) compared to Group B (142.7 ± 25.3 mg/dL and 206.3 ± 41.2 mg/dL respectively), both with p-values <0.001. These findings are in line with the UKPDS study results reported by UKPDS Group,[18] where intensive glucose lowering improved metabolic profiles early in the disease course. The mean HbA1c in Group A was 6.4 ± 0.3%, whereas in Group B it was significantly higher at 8.1 ± 0.7%, echoing the findings of the ADVANCE trial led by ADVANCE Collaborative Group,[19] where tighter glycemic control translated into better clinical outcomes. Furthermore, the lower mean BMI, systolic blood pressure, and LDL cholesterol in Group A compared to Group B suggest a broader cardiometabolic benefit of early glycemic control, similar to observations made by Hayward et al,[20] in the VADT follow-up study.

The evaluation of early diabetes-related complications at 6 months showed that neuropathy was significantly less frequent in Group A (5.3%) compared to Group B (16.7%), with a p-value of 0.034. Microalbuminuria was also significantly lower in Group A (7.9%) than in Group B (20.4%) (p=0.041). These findings resonate with the findings of the ACCORD study conducted by Action to Control Cardiovascular Risk in Diabetes Study Group,[21] which demonstrated that intensive glycemic control significantly reduced the risk of microvascular complications. Although the incidence of retinopathy was lower in Group A (2.6%) compared to Group B (9.3%), the difference was not statistically significant within the short follow-up duration, similar to observations reported by Holman et al,[22] where longer follow-up was required to detect differences in eye-related outcomes. Our study thus supports the concept that early glycemic control not only improves metabolic parameters but also translates into a meaningful reduction in early microvascular complications.

Comparing our findings to broader cohorts, Gregg et al,[13] reported a general decline in diabetes-related complications over two decades in the U.S., which they attributed to better early glycemic control and cardiovascular risk management. Our results further strengthen the importance of this approach in newly diagnosed patients. Similarly, Monnier et al,[14] emphasized the importance of glucose stability and the minimization of glucose variability in reducing complications, highlighting another important target for early intervention strategies.

CONCLUSION

Early achievement of glycemic control in newly diagnosed Type 2 Diabetes Mellitus patients significantly improves metabolic parameters and reduces the risk of early diabetes-related complications. Our findings emphasize the importance of prompt and aggressive management strategies at diagnosis to alter the disease trajectory. Early intervention can preserve beta-cell function, enhance long-term outcomes, and minimize the future burden of microvascular and macrovascular complications.

REFERENCES

1. Packer M. Critical reanalysis of the mechanisms underlying the cardiorenal benefits of SGLT2 inhibitors and reaffirmation of the nutrient deprivation signaling/autophagy hypothesis. Circulation. 2022;146(18):1383-405.
2. Rossi MC, Nicolucci A, Arcangeli A, et al. Baseline quality-of-care data from a quality-improvement program implemented by a network of diabetes outpatient clinics. Diabetes Care. 2008;31(11):2166-8.
3. Prattichizzo F, La Sala L, Ceriello A. Two drugs are better than one to start T2DM therapy. Nat Rev Endocrinol. 2020;16(1):15-6.
4. Russo G, Monami M, Perseghin G, et al. The "early treatment" approach reducing cardiovascular risk in patients with type 2 diabetes: a consensus from an expert panel using the Delphi technique. Diabetes Ther. 2021;12(5):1445-61.
5. Bjornstad P, Drews KL, Caprio S, et al.; TODAY Study Group. Long-term complications in youth-onset type 2 diabetes. N Engl J Med. 2021;385:416-26.
6. RISE Consortium Investigators. Effects of treatment of impaired glucose tolerance or recently diagnosed type 2 diabetes with metformin alone or in combination with insulin glargine on β-cell function: comparison of responses in youth and adults. Diabetes. 2019;68:1670-80.
7. Utzschneider KM, Tripputi MT, Kozedub A, et al.; RISE Consortium. Differential loss of β-cell function in youth vs. adults following treatment withdrawal in the Restoring Insulin

Secretion (RISE) study. Diabetes Res Clin Pract. 2021;178:108948.
8. Arslanian SA, El Ghormli L, Kim JY, et al.; RISE Consortium. OGTT glucose response curves, insulin sensitivity, and β-cell function in RISE: comparison between youth and adults at randomization and in response to interventions to preserve β-cell function. Diabetes Care. 2021;44:817-25.
9. RISE Consortium. Metabolic contrasts between youth and adults with impaired glucose tolerance or recently diagnosed type 2 diabetes: I. Observations using the hyperglycemic clamp. Diabetes Care. 2018;41:1696-706.
10. Bacha F, Pyle L, Nadeau K, et al.; TODAY Study Group. Determinants of glycemic control in youth with type 2 diabetes at randomization in the TODAY study. Pediatr Diabetes. 2012;13:376-83.
11. Olson DE, Rhee MK, Herrick K, Ziemer DC, Twombly JG, Phillips LS. Screening for diabetes and pre-diabetes with proposed A1C-based diagnostic criteria. Diabetes Care. 2010;33:2184-9.
12. Harris MI, Cowie CC, Eastman R. Health-insurance coverage for adults with diabetes in the U.S. population. Diabetes Care. 1994;17:585-91.
13. Gregg EW, Li Y, Wang J, et al. Changes in diabetes-related complications in the United States, 1990-2010. N Engl J Med. 2014;370:1514-23.
14. Monnier L, Colette C, Schlienger JL, Bauduceau B, Owens DR. Glucocentric risk factors for macrovascular complications in diabetes: glucose 'legacy' and 'variability': what we see, know and try to comprehend. Diabetes Metab. 2019;45:401-8.
15. Blumenthal KJ, Larkin ME, Winning G, Nathan DM, Grant RW. Changes in glycemic control from 1996 to 2006 among adults with type 2 diabetes: a longitudinal cohort study. BMC Health Serv Res. 2010;10:158.
16. Zeitler P, Hirst K, Copeland KC, et al.; TODAY Study Group. HbA1c after a short period of monotherapy with metformin identifies durable glycemic control among adolescents with type 2 diabetes. Diabetes Care. 2015;38:2285-92.
17. Laiteerapong N, Ham SA, Gao Y, Moffet HH, Liu JY, Huang ES, et al. The legacy effect in type 2 diabetes: impact of early glycemic control on future complications (The Diabetes & Aging Study). Diabetes Care. 2019;42(3):416-26.
18. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998;352:837-53.
19. ADVANCE Collaborative Group, Patel A, MacMahon S, Chalmers J, Neal B, Billot L, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. N Engl J Med. 2008;358:2560-72.
20. Hayward RA, Reaven PD, Wiitala WL, et al.; VADT Investigators. Follow-up of glycemic control and cardiovascular outcomes in type 2 diabetes. N Engl J Med. 2015;372:2197-206.
21. Action to Control Cardiovascular Risk in Diabetes Study Group, Gerstein HC, Miller ME, Byington RP, Goff DC Jr, Bigger JT, et al. Effects of intensive glucose lowering in type 2 diabetes. N Engl J Med. 2008;358:2545-59.
22. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10-year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med. 2008;359:1577-89.