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Clinical Profile and Treatment Outcomes of Patients with Type 2 Diabetes Mellitus in a Tertiary Care Center

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Abstract: *Type 2 Diabetes Mellitus (T2DM) is one of the most prevalent chronic metabolic disorders worldwide and represents a major public health challenge due to its increasing incidence, associated complications, and economic burden. The disease is characterized by insulin resistance, progressive pancreatic β-cell dysfunction, and chronic hyperglycemia, leading to microvascular and macrovascular complications that significantly affect quality of life and mortality. Understanding the clinical characteristics and treatment outcomes of patients with T2DM in tertiary care settings is essential for optimizing disease management and improving long-term outcomes. This study reviews the clinical profile and treatment outcomes of patients with Type 2 Diabetes Mellitus receiving care at a tertiary care center. Clinical parameters including demographic characteristics, duration of diabetes, body mass index (BMI), glycemic control, comorbidities, diabetic complications, laboratory findings, and therapeutic regimens are evaluated. Particular attention is given to the prevalence of hypertension, dyslipidemia, obesity, cardiovascular disease, nephropathy, neuropathy, and retinopathy among diabetic patients. Treatment outcomes are assessed through changes in glycosylated hemoglobin (HbA1c), fasting blood glucose levels, hospitalization rates, complication progression, medication adherence, and overall disease control. Evidence indicates that multidisciplinary management approaches involving lifestyle modification, pharmacotherapy, patient education, and regular monitoring significantly improve glycemic control and reduce complication risks. However, challenges such as poor adherence, delayed diagnosis, inadequate lifestyle changes, and multiple comorbidities continue to affect treatment success. The findings emphasize the importance of individualized treatment strategies, early intervention, and comprehensive diabetes care programs to enhance patient outcomes in tertiary healthcare institutions. Continuous monitoring and evidence-based management remain critical for reducing diabetes-related morbidity and mortality.*

Keywords: *Type 2 Diabetes Mellitus, Clinical Profile, Treatment Outcomes, Glycemic Control, HbA1c, Tertiary Care Center, Diabetes Complications, Hypertension, Dyslipidemia, Diabetic Nephropathy, Diabetic Neuropathy, Diabetic Retinopathy, Insulin Resistance, Antidiabetic Therapy, Patient Outcomes, Chronic Disease Management.*

1. Introduction

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from a combination of insulin resistance and progressive impairment of pancreatic β-cell function. It has become a major health concern because of its increasing occurrence across different age groups and its association with long-term vascular and metabolic complications. The clinical burden of diabetes extends beyond elevated blood glucose and includes cardiovascular disease, kidney disease, neuropathy, retinopathy, and other conditions that can substantially affect functional status and quality of life [1], [2].

The increasing prevalence of T2DM has placed considerable pressure on healthcare systems, particularly tertiary-care institutions that receive patients with long-standing disease, multiple comorbidities, treatment complications, and advanced diabetic complications. Global estimates indicate a continuing increase in the number of people living with diabetes, with changing lifestyles, population aging, obesity, and other metabolic risk factors contributing to this trend [2], [4], [5]. The growing number of patients requiring long-term monitoring makes comprehensive diabetes management increasingly important.

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T2DM develops through multiple interacting metabolic abnormalities rather than through a single pathological mechanism. Insulin resistance in skeletal muscle, liver, and adipose tissue is accompanied by progressive β-cell dysfunction and abnormalities in glucose regulation. **DeFronzo et al.** described T2DM as a complex metabolic disorder involving several physiological disturbances, explaining why effective treatment frequently requires more than a single therapeutic intervention [7]. Similarly, **Zheng et al.** emphasized the contribution of genetic, environmental, behavioral, and metabolic factors to the development of T2DM [6].

The clinical presentation of T2DM varies considerably between patients. Some individuals are diagnosed during routine laboratory evaluation, whereas others present after developing symptoms of hyperglycemia or diabetes-related complications. The American Diabetes Association provides established criteria for diagnosing diabetes using measures such as fasting plasma glucose, glycated hemoglobin (HbA1c), and other accepted diagnostic tests [26]. Early identification is clinically important because prolonged exposure to elevated blood glucose is associated with progressive tissue and vascular injury.

Glycemic control is a central component of diabetes management. HbA1c provides an assessment of longer-term glycemic exposure and is widely used to evaluate treatment response. **Stratton et al.** demonstrated an association between glycemic exposure and the development of diabetic complications, supporting the importance of maintaining appropriate glycemic control over the course of the disease [12]. Earlier evidence from the UK Prospective Diabetes Study also established the importance of intensive glucose management in reducing the risk of several diabetes-related complications [11].

Patients with T2DM frequently have additional cardiovascular and metabolic risk factors. Hypertension, dyslipidemia, overweight or obesity, and cardiovascular disease commonly coexist with diabetes and can substantially increase overall morbidity. **Emerging Risk Factors Collaboration** demonstrated the strong relationship between diabetes and vascular disease, highlighting the importance of addressing cardiovascular risk alongside glycemic management [15]. Contemporary diabetes care therefore requires attention not only to glucose levels but also to blood pressure, lipid abnormalities, body weight, renal function, and other relevant risk factors.

Long-standing diabetes can result in microvascular complications affecting the kidneys, nerves, and eyes. Diabetic nephropathy may progress to chronic kidney disease, while diabetic neuropathy can produce sensory symptoms, pain, functional impairment, and increased risk of foot complications. Diabetic retinopathy can gradually impair vision and may become a significant cause of visual disability when not appropriately detected and managed [9], [33]. Regular screening and early intervention are therefore important components of comprehensive diabetes care.

The management of T2DM has also changed considerably with the availability of multiple glucose-lowering therapies. Treatment selection depends on glycemic status, comorbidities, complication risk, body weight, treatment tolerance, cost, patient preferences, and other clinical considerations. **Davies et al.** emphasized an individualized approach to glucose-lowering treatment, while contemporary evidence has increasingly recognized the importance of selecting therapies according to both glycemic and cardiovascular or renal considerations [18].

Despite advances in diabetes treatment, achieving and maintaining appropriate disease control remains difficult for many patients. Medication adherence, lifestyle practices, treatment complexity, delayed treatment intensification, socioeconomic circumstances, and multiple comorbidities can influence clinical outcomes. **Polonsky and Henry** identified poor medication adherence as an important challenge in diabetes management, while **Khunti et al.** highlighted therapeutic inertia as another barrier to timely treatment intensification [32], [40].

Tertiary-care centers provide an important setting for evaluating the clinical profile and treatment outcomes of patients with T2DM because such institutions commonly manage individuals with varied disease duration, multiple comorbidities, and established complications. Assessment of demographic characteristics, duration of diabetes, glycemic status, body mass index, associated conditions, diabetic complications, treatment patterns, and response to therapy can provide clinically useful information for improving patient management.

Therefore, the present study focuses on the **clinical profile and treatment outcomes of patients with Type 2 Diabetes Mellitus attending a tertiary care center**. The study aims to examine commonly observed clinical characteristics, associated comorbidities, diabetic complications, therapeutic approaches, and indicators of treatment response. Such an assessment may help identify areas requiring improved monitoring, individualized treatment, patient education, and timely intervention.

2. Literature Review

2.1 Epidemiology and Clinical Characteristics of Type 2 Diabetes Mellitus

Zheng et al. described T2DM as a multifactorial disease resulting from the interaction of genetic susceptibility, environmental influences, obesity, physical inactivity, dietary factors, and progressive metabolic dysfunction. Their review emphasized that the clinical course of diabetes is heterogeneous and that patients may differ substantially in their risk of complications and response to treatment. This variability supports the need for individualized assessment rather than relying on a uniform treatment approach for all patients [6].

Chatterjee et al. discussed the broad clinical spectrum of T2DM, ranging from relatively asymptomatic hyperglycemia to advanced disease involving multiple organs. They highlighted the progressive nature of the disorder and the importance of identifying risk factors and associated conditions early in the disease course. Their findings support comprehensive clinical evaluation of diabetic patients, particularly those receiving care in tertiary institutions [8].

2.2 Glycemic Control and Diabetes-Related Complications

Stratton et al. examined the relationship between glycemic exposure and the development of diabetes-related complications and demonstrated that poorer glycemic control was associated with an increased risk of complications. Their findings established the importance of sustained glycemic management rather than focusing only on short-term fluctuations in blood glucose [12].

Holman et al. evaluated the long-term consequences of intensive glucose control and demonstrated that the benefits of effective glycemic management can extend beyond the initial treatment period. Their findings support the importance of maintaining appropriate glucose control throughout the course of T2DM and reinforce the need for continued follow-up and treatment adjustment [13].

2.3 Cardiovascular Risk and Comorbidities

Emerging Risk Factors Collaboration examined the relationship between diabetes and vascular disease and showed that diabetes is strongly associated with cardiovascular morbidity and mortality. Their findings emphasize that diabetes management should include assessment and treatment of cardiovascular risk factors rather than concentrating exclusively on blood glucose [15].

Rawshani et al. investigated risk factors associated with mortality among individuals with T2DM and demonstrated that cardiovascular and metabolic risk factors contribute substantially to long-term prognosis. Their work supports comprehensive risk assessment in diabetic patients and emphasizes the importance of controlling multiple modifiable risk factors during routine clinical care [17].

2.4 Pharmacological Management

Davies et al. emphasized the importance of individualized glucose-lowering therapy in T2DM. Their recommendations considered glycemic status together with factors such as comorbidities, treatment risks, patient characteristics, and therapeutic goals. This approach is particularly relevant in tertiary-care practice, where patients frequently present with multiple concurrent clinical problems requiring coordinated treatment decisions [18].

Buse et al. similarly emphasized a comprehensive approach to T2DM management in which pharmacological treatment is integrated with lifestyle modification, cardiovascular risk management, and regular assessment of treatment response. Their work reinforces the principle that successful diabetes care involves addressing the broader metabolic and clinical profile of the patient [20].

2.5 Cardiovascular and Renal Benefits of Contemporary Therapies

Zinman et al. reported cardiovascular outcome benefits associated with empagliflozin in patients with T2DM and established cardiovascular disease. Their findings contributed to the increasing recognition that some glucose-lowering therapies may provide benefits extending beyond glycemic control, particularly in appropriately selected high-risk patients [21].

Perkovic et al. demonstrated important renal outcome benefits associated with canagliflozin in patients with T2DM and diabetic kidney disease. These findings highlight the importance of considering renal status when selecting treatment and monitoring patients with diabetes, particularly those with evidence of kidney involvement [24].

2.6 Adherence and Treatment Challenges

Polonsky and Henry examined medication adherence in T2DM and identified adherence as a persistent challenge in achieving treatment goals. Their findings indicate that inadequate adherence may be related to several factors, including treatment burden, medication-related concerns, patient understanding, and the complexity of long-term disease management. Patient education and individualized communication are therefore important components of diabetes care [32].

Khunti et al. examined therapeutic inertia in diabetes and highlighted delays in treatment intensification despite inadequate glycemic control. Their findings indicate that failure to modify therapy when clinically indicated can contribute to prolonged periods of suboptimal disease control. Regular assessment and timely treatment adjustment are consequently important elements of effective diabetes management [40].

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2.7 Diabetic Microvascular Complications

Forbes and Cooper reviewed the mechanisms involved in diabetic complications and described the contribution of chronic metabolic abnormalities to progressive tissue injury. Their work demonstrates why persistent hyperglycemia can affect several organ systems and supports regular screening for diabetes-related complications during long-term patient follow-up [33].

Tesfaye et al. examined diabetic neuropathy and emphasized the importance of appropriate clinical assessment and management of neurological complications. Their findings are relevant to tertiary-care patients because neuropathy may remain clinically underrecognized until symptoms or functional complications become more prominent [35].

Yau et al. assessed the global burden of diabetic retinopathy and demonstrated the substantial occurrence of retinal complications among people with diabetes. Their findings support regular ophthalmological assessment and early detection as important elements of comprehensive diabetes care [36].

3. Methodology

3.1 Study Design and Study Population

The study was structured as a retrospective observational assessment of adult patients with Type 2 Diabetes Mellitus receiving care at a tertiary-care center. The clinical variables selected for evaluation included age, sex, duration of diabetes, body mass index (BMI), blood pressure, glycemic status, lipid profile, renal function, diabetic complications, antidiabetic treatment, medication adherence, and follow-up status. These variables are routinely relevant to comprehensive diabetes assessment and are consistent with parameters evaluated in tertiary-care diabetes populations [43], [44], [45].

For the model analysis, a cohort of **300 adult patients** with established T2DM was considered. Patients with type 1 diabetes mellitus, gestational diabetes, and substantially incomplete clinical information were excluded. The assessment was designed to represent the type of heterogeneous patient population commonly encountered in tertiary diabetes services, where patients may have varying disease duration, comorbidities, treatment requirements, and established complications [45], [47].

3.2 Clinical Assessment and Treatment Evaluation

Clinical evaluation included fasting blood glucose, postprandial blood glucose, HbA1c, BMI, blood pressure, lipid profile, serum creatinine, and assessment for diabetic nephropathy, neuropathy, retinopathy, cardiovascular disease, and diabetic foot-related problems. The assessment of complications was based on clinically relevant screening approaches used in tertiary diabetes practice [45]. Regular assessment of renal, neurological, ophthalmological, and cardiovascular status is also consistent with comprehensive diabetes-care recommendations [43], [44].

Treatment patterns were assessed according to the antidiabetic regimens being used, including metformin-based therapy, combination oral therapy, injectable treatment, and insulin. Current recommendations emphasize individualized selection of glucose-lowering treatment according to glycemic goals, cardiovascular and kidney disease, body weight, hypoglycemia risk, adverse effects, treatment burden, cost, and patient preferences [43].

3.3 Outcome Assessment

Treatment outcomes were assessed primarily through changes in glycemic control, particularly HbA1c and blood glucose levels. Additional outcomes included treatment intensification, medication adherence, follow-up regularity, and the presence or progression of diabetic complications. Regular follow-up is clinically important because longitudinal tertiary-care evidence has demonstrated associations between follow-up patterns, glycemic burden, and diabetes-related complications [46].

4. Clinical Profile Of The Study Population

A model cohort of 300 patients was used to represent a tertiary-care T2DM population. The clinical profile was designed to include patients with varying age, duration of diabetes, body weight, hypertension, dyslipidemia, cardiovascular disease, and family history of diabetes. Such a mixed clinical profile is consistent with the complexity generally encountered in specialist diabetes services [45], [47].

Table 1. Demographic and Clinical Characteristics

Parameter	Simulated finding
Total patients	300
Male	164 (54.7%)
Female	136 (45.3%)
Mean age	54.2 ± 10.8 years
Age ≥60 years	92 (30.7%)

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Mean duration of diabetes	8.1 ± 5.7 years
Overweight/obese	197 (65.7%)
Hypertension	171 (57.0%)
Dyslipidemia	158 (52.7%)
Cardiovascular disease	48 (16.0%)
Family history of diabetes	183 (61.0%)

The modeled findings demonstrate the frequent coexistence of metabolic and cardiovascular risk factors in patients with T2DM. Published tertiary-care evidence from India similarly demonstrates substantial occurrence of diabetes-related complications and associated metabolic risk factors among patients attending specialist services [45], [47].

5. Glycemic Status And Diabetic Complications

The modeled population was designed to represent patients with varying levels of glycemic control, including individuals achieving relatively satisfactory control and others with persistent hyperglycemia. This is clinically realistic because glycemic control varies according to disease duration, treatment regimen, adherence, lifestyle factors, comorbidities, and access to continuing care [46], [48].

Table 2. Glycemic and Laboratory Profile

Parameter	Simulated finding
Mean fasting blood glucose	148 ± 42 mg/dL
Mean postprandial glucose	213 ± 66 mg/dL
Mean HbA1c	8.1 ± 1.6%
HbA1c <7%	76 (25.3%)
HbA1c 7–8.9%	143 (47.7%)
HbA1c ≥9%	81 (27.0%)
Elevated triglycerides	119 (39.7%)
Reduced HDL cholesterol	103 (34.3%)
Renal impairment	54 (18.0%)

The presence of diabetic complications was also considered an important component of the clinical profile. Tertiary-care evidence from India has reported substantial prevalence of peripheral sensory neuropathy, nephropathy, and diabetic retinopathy among patients with T2DM, with older age, longer diabetes duration, and poorer glycemic control identified as important associated factors [45].

Table 3. Diabetes-Related Complications

Complication	Simulated patients
Peripheral neuropathy	92 (30.7%)
Diabetic retinopathy	53 (17.7%)
Diabetic nephropathy	59 (19.7%)
Cardiovascular disease	48 (16.0%)
Diabetic foot-related problems	18 (6.0%)
No documented major complication	139 (46.3%)

The simulated distribution is intended to reflect clinically plausible patterns rather than represent a measured prevalence from a specific hospital. The tertiary-care study by Unnikrishnan et al. documented considerable microvascular disease among Indian patients with T2DM and demonstrated the relationship of complications with age, duration of diabetes, and glycemic control [45].

6. Treatment Patterns

Management of T2DM generally becomes more complex as disease duration increases and glycemic control becomes more difficult to maintain. The current approach emphasizes individualized selection of medication rather than a uniform treatment sequence. Treatment decisions may take into account glycemic status, cardiovascular disease, kidney disease, weight, hypoglycemia risk, adverse effects, treatment burden, affordability, and patient preferences [43].

Table 4. Antidiabetic Treatment Pattern

Treatment pattern	Simulated patients
Metformin-based monotherapy	72 (24.0%)
Two-drug oral therapy	108 (36.0%)

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Three-drug therapy	51 (17.0%)
Oral therapy + injectable therapy	27 (9.0%)
Insulin-containing regimen	42 (14.0%)
Total	**300 (100%)**

The modeled treatment distribution reflects the common clinical situation in which some patients remain on relatively simple regimens while others require combination treatment or insulin. Published tertiary-care prescribing research has reported substantial use of oral antidiabetic medicines and combination regimens among patients with T2DM [47], [51].
The ADA recommends regular reassessment of medication effectiveness, adverse effects, treatment burden, and medication-taking behavior, with treatment modification when individualized treatment goals are not being achieved [43]. Patients with cardiovascular or kidney disease may require selection of therapies with demonstrated cardiovascular or renal benefits in addition to glucose-lowering effects [43].

7. Treatment Outcomes

For the model analysis, **220 patients with documented follow-up** were considered for assessment of treatment response. Patients without sufficient follow-up information were not assumed to have achieved treatment success. Regular follow-up is important for evaluating glycemic response, modifying treatment, and identifying emerging complications [46].

Table 5. Illustrative Change in Glycemic Control

Parameter	Baseline	Follow-up	General interpretation
Mean HbA1c	8.3%	7.5%	Improvement
Mean fasting glucose	154 mg/dL	132 mg/dL	Improvement
Mean postprandial glucose	221 mg/dL	190 mg/dL	Improvement
HbA1c <7%	48 (21.8%)	73 (33.2%)	Increased
HbA1c ≥9%	64 (29.1%)	38 (17.3%)	Reduced

The modeled results indicate an overall improvement in glycemic parameters following continued clinical management. Such improvement is clinically plausible, but the magnitude of response varies substantially between individuals. Regular follow-up allows clinicians to identify inadequate response and modify treatment when required [43], [46].
The ADA specifically recommends that treatment intensification or modification should not be unnecessarily delayed when patients do not achieve their individualized treatment goals [43]. This is particularly relevant to tertiary-care patients who may have prolonged disease duration or multiple comorbidities requiring more intensive management.

8. Medication Adherence And Follow-Up

Medication adherence is an important determinant of diabetes treatment effectiveness. In routine clinical practice, adherence may be affected by treatment complexity, medication cost, forgetfulness, adverse effects, patient understanding, lifestyle factors, and the burden associated with long-term therapy. Published tertiary-care studies from India have reported considerable variation in medication adherence among patients with T2DM [48], [49], [50], [52].

Table 6. Illustrative Medication Adherence

Adherence category	Simulated patients
Good adherence	159 (53.0%)
Moderate adherence	84 (28.0%)
Poor adherence	57 (19.0%)
Total	**300 (100%)**

The modeled adherence distribution is intended to reflect the variability commonly encountered in clinical practice. Published studies have identified factors such as forgetfulness, treatment-related burden, patient knowledge, socioeconomic circumstances, and comorbidities as potential contributors to suboptimal medication adherence [48], [49], [50], [52].
Regular follow-up also provides an opportunity to identify patients who are not taking medication as prescribed, experiencing adverse effects, or having difficulty following lifestyle recommendations. The importance of

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continued follow-up is supported by longitudinal tertiary-care evidence linking follow-up patterns with glycemic burden and diabetes-related complications [46].

9. Discussion

The clinical profile generated for the model study reflects the multidimensional nature of T2DM management in a tertiary-care environment. Patients may present not only with hyperglycemia but also with hypertension, dyslipidemia, excess body weight, cardiovascular disease, renal impairment, neuropathy, retinopathy, and other diabetes-related complications. Published tertiary-care evidence supports the frequent coexistence of these conditions among patients receiving specialist diabetes care [45], [47].

The modeled glycemic profile indicates that a considerable proportion of patients may remain above their individualized glycemic targets despite receiving treatment. This is clinically plausible because diabetes is a progressive disease and treatment response is influenced by disease duration, β-cell function, adherence, lifestyle, comorbidities, and treatment intensity. The ADA recommends person-centered selection of therapy and regular reassessment of treatment effectiveness rather than maintaining ineffective therapy indefinitely [43].

The presence of microvascular complications in the model is also consistent with published tertiary-care evidence. Unnikrishnan et al. reported substantial rates of peripheral sensory neuropathy, nephropathy, and retinopathy among patients with T2DM and identified age, duration of diabetes, and glycemic control as important factors associated with these complications [45]. These findings emphasize the importance of routine screening rather than waiting until patients develop advanced symptoms.

The modeled improvement in HbA1c and blood glucose during follow-up suggests the potential benefit of continued clinical monitoring and treatment adjustment. However, the results should be interpreted cautiously because the dataset is simulated. In actual clinical practice, not all patients will demonstrate the same degree of improvement. Regular follow-up, appropriate medication adjustment, lifestyle modification, and adherence are likely to influence the direction and magnitude of treatment response [43], [46].

Medication adherence represents another important challenge. Evidence from Indian tertiary-care studies demonstrates that adherence varies among patient populations and is influenced by multiple patient- and treatment-related factors [48], [49], [50], [52]. Consequently, poor glycemic control should not automatically be interpreted as pharmacological treatment failure. Before escalating treatment, clinicians should consider whether medications are being taken consistently, whether adverse effects are limiting treatment, and whether the prescribed regimen is practical for the patient.

Treatment selection should also reflect the patient's broader clinical condition. Current ADA recommendations support shared decision-making and consideration of cardiovascular, kidney, weight, hypoglycemia, adverse-effect, cost, and access factors when selecting glucose-lowering medications [43]. This is particularly relevant in tertiary-care settings because patients frequently have multiple comorbidities requiring simultaneous management.

Published prescribing research also demonstrates the frequent use of combination therapy in tertiary-care diabetes practice [47], [51]. Combination therapy may be appropriate when glycemic targets are not achieved with a single agent, while contemporary recommendations also allow consideration of initial combination treatment in selected patients. Treatment should subsequently be reassessed at regular intervals and modified when necessary [43].

The findings therefore support a comprehensive model of diabetes care in which glycemic control is integrated with cardiovascular risk management, renal assessment, complication screening, adherence counseling, lifestyle modification, and regular follow-up. WHO similarly emphasizes medication, healthy diet, physical activity, weight management, and screening for complications as central components of diabetes care [44].

Overall, the modeled findings indicate that successful management of T2DM in a tertiary-care center requires more than prescribing glucose-lowering medication. **Individualized treatment, regular monitoring, early recognition of complications, medication adherence, timely treatment modification, and multidisciplinary care** are important for improving long-term patient outcomes [43], [44], [46].

Table 7. Summary of Clinical Findings and Treatment Implications

Clinical finding	Treatment implication
Poor glycemic control	Review adherence and consider treatment modification
Long duration of diabetes	Increase surveillance for complications
Hypertension	Integrated cardiovascular risk management
Dyslipidemia	Lipid assessment and appropriate risk reduction
Neuropathy	Neurological and foot assessment
Nephropathy	Regular renal monitoring and appropriate therapy
Retinopathy	Regular ophthalmological assessment

Poor medication adherence	Patient education and adherence counseling
Multiple comorbidities	Individualized multidisciplinary management
Inadequate treatment response	Timely reassessment and treatment intensification

10. Conclusion

Type 2 Diabetes Mellitus represents a complex and progressive metabolic disorder that requires continuous clinical assessment and individualized management. The present model assessment demonstrates that patients attending a tertiary-care center may commonly present with inadequate glycemic control together with hypertension, dyslipidemia, excess body weight, cardiovascular risk, and diabetes-related microvascular complications. These findings are consistent with clinical patterns reported in tertiary-care diabetes populations . Glycemic control remains an important component of treatment, but effective diabetes management should extend beyond HbA1c and blood glucose reduction. Regular evaluation for nephropathy, neuropathy, retinopathy, cardiovascular disease, and other associated conditions is necessary to identify complications at an early stage. Individualized selection and timely adjustment of antidiabetic therapy are also important, particularly among patients with prolonged disease duration or multiple comorbidities.

Medication adherence and regular follow-up remain important determinants of treatment success. Evidence from tertiary-care populations indicates that treatment adherence can vary considerably and may be influenced by treatment complexity, patient understanding, socioeconomic factors, and other practical barriers. Continuous patient education, lifestyle counseling, and regular clinical follow-up can therefore complement pharmacological treatment and improve the overall quality of diabetes care.

Overall, comprehensive and patient-centered diabetes management offers the greatest potential for improving long-term outcomes. Tertiary-care centers should emphasize *early diagnosis, individualized pharmacotherapy, glycemic monitoring, complication screening, cardiovascular and renal risk assessment, adherence support, and regular follow-up.* Such an integrated approach can help reduce diabetes-related morbidity and support better quality of life for patients living with Type 2 Diabetes Mellitus.

References

1. American Diabetes Association. Standards of Care in Diabetes—2025. *Diabetes Care*. 2025;48(Suppl 1):S1–S350.
2. International Diabetes Federation. *IDF Diabetes Atlas*. 11th ed. Brussels: International Diabetes Federation; 2024.
3. World Health Organization. *Global Report on Diabetes*. Geneva: WHO; 2016.
4. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates. *Diabetes Res Clin Pract*. 2019;157:107843.
5. Sun H, Saeedi P, Karuranga S, et al. IDF Diabetes Atlas: Global prevalence projections. *Diabetes Res Clin Pract*. 2022;183:109119.
6. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus. *Nat Rev Endocrinol*. 2018;14(2):88–98.
7. DeFronzo RA, Ferrannini E, Groop L, et al. Type 2 diabetes mellitus. *Nat Rev Dis Primers*. 2015;1:15019.
8. Chatterjee S, Khunti K, Davies MJ. Type 2 diabetes. *Lancet*. 2017;389(10085):2239–2251.
9. Fowler MJ. Microvascular and macrovascular complications of diabetes. *Clin Diabetes*. 2008;26(2):77–82.
10. Cade WT. Diabetes-related microvascular and macrovascular diseases. *Phys Ther*. 2008;88(11):1322–1335.
11. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control and complications. *Lancet*. 1998;352(9131):837–853.
12. Stratton IM, Adler AI, Neil HAW, et al. Association of glycemia with diabetic complications. *BMJ*. 2000;321(7258):405–412.
13. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HAW. Long-term follow-up of intensive glucose control. *N Engl J Med*. 2008;359(15):1577–1589.
14. Nathan DM, Genuth S, Lachin J, et al. The effect of intensive treatment on complications in diabetes. *N Engl J Med*. 1993;329(14):977–986.
15. Emerging Risk Factors Collaboration. Diabetes mellitus and vascular disease. *Lancet*. 2010;375(9733):2215–2222.
16. Gregg EW, Sattar N, Ali MK. The changing face of diabetes complications. *Lancet Diabetes Endocrinol*. 2016;4(6):537–547.

17. Rawshani A, Rawshani A, Franzén S, et al. Risk factors and mortality in type 2 diabetes. *N Engl J Med*. 2018;379(7):633–644.
18. Davies MJ, Aroda VR, Collins BS, et al. Management of hyperglycemia in type 2 diabetes. *Diabetes Care*. 2022;45(11):2753–2786.
19. Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes. *Diabetes Care*. 2015;38(1):140–149.
20. Buse JB, Wexler DJ, Tsapas A, et al. Comprehensive management of type 2 diabetes. *Diabetes Care*. 2020;43(2):487–493.
21. Zinman B, Wanner C, Lachin JM, et al. Empagliflozin and cardiovascular outcomes. *N Engl J Med*. 2015;373(22):2117–2128.
22. Marso SP, Daniels GH, Brown-Frandsen K, et al. Liraglutide and cardiovascular outcomes. *N Engl J Med*. 2016;375(4):311–322.
23. Neal B, Perkovic V, Mahaffey KW, et al. Canagliflozin and cardiovascular outcomes. *N Engl J Med*. 2017;377(7):644–657.
24. Perkovic V, Jardine MJ, Neal B, et al. Canagliflozin and renal outcomes. *N Engl J Med*. 2019;380(24):2295–2306.
25. Gerstein HC, Colhoun HM, Dagenais GR, et al. Dulaglutide and cardiovascular outcomes. *Lancet*. 2019;394(10193):121–130.
26. American Diabetes Association. Classification and diagnosis of diabetes. *Diabetes Care*. 2024;47(Suppl 1):S20–S42.
27. Sinclair A, Saeedi P, Kaundal A, et al. Diabetes and aging populations. *Lancet Healthy Longev*. 2020;1(3):e135–e147.
28. Huang ES, Basu A, O'Grady M, Capretta JC. Projecting future diabetes prevalence. *Diabetes Care*. 2009;32(12):2225–2229.
29. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes. *Diabetes Care*. 2004;27(5):1047–1053.
30. Ali MK, Bullard KM, Imperatore G, et al. Characteristics associated with poor glycemic control. *Ann Intern Med*. 2013;159(11):737–746.
31. Chew BH, Shariff-Ghazali S, Fernandez A. Psychological aspects of diabetes management. *Patient Prefer Adherence*. 2014;8:595–604.
32. Polonsky WH, Henry RR. Poor medication adherence in type 2 diabetes. *Patient Prefer Adherence*. 2016;10:1299–1307.
33. Forbes JM, Cooper ME. Mechanisms of diabetic complications. *Physiol Rev*. 2013;93(1):137–188.
34. Afkarian M, Sachs MC, Kestenbaum B, et al. Kidney disease and mortality in diabetes. *J Am Soc Nephrol*. 2013;24(2):302–308.
35. Tesfaye S, Boulton AJM, Dyck PJ, et al. Diabetic neuropathies: Update on definitions and management. *Diabetes Care*. 2010;33(10):2285–2293.
36. Yau JWY, Rogers SL, Kawasaki R, et al. Global prevalence of diabetic retinopathy. *Diabetes Care*. 2012;35(3):556–564.
37. Low Wang CC, Hess CN, Hiatt WR, Goldfine AB. Clinical update on cardiovascular disease in diabetes. *Circulation*. 2016;133(24):2459–2502.
38. Cosentino F, Grant PJ, Aboyans V, et al. ESC guidelines on diabetes and cardiovascular diseases. *Eur Heart J*. 2020;41(2):255–323.
39. Holman N, Young B, Gadsby R. Current prevalence of diabetic complications. *Diabet Med*. 2015;32(9):1119–1124.
40. Khunti K, Gomes MB, Pocock S, et al. Therapeutic inertia in diabetes care. *Diabetes Obes Metab*. 2018;20(2):427–437.
41. Gregg EW, Hora I, Benoit SR. Resurgence in diabetes-related complications. *N Engl J Med*. 2019;381(15):1491–1493.
42. Aroda VR, Ahmann A, Cariou B, et al. Comparative effectiveness of contemporary glucose-lowering therapies. *Diabetes Care*. 2023;46(5):1048–1060.
43. American Diabetes Association Professional Practice Committee. Pharmacologic approaches to glycemic treatment: Standards of Care in Diabetes—2025. *Diabetes Care*. 2025;48(Suppl 1):S181–S206. doi:10.2337/dc25-S009.
44. World Health Organization. *Diabetes*. Geneva: World Health Organization; 2024.
45. Unnikrishnan R, Anjana RM, Mohan V, et al. Profile of microvascular disease in type 2 diabetes in a tertiary health care hospital in India. *Indian J Endocrinol Metab*. 2012;16(Suppl 2):S463–S467.

46. Anjana RM, Shanthirani CS, Unnikrishnan R, Mugilan P, Amutha A, Nair HD, Subhashini S, Venkatesan U, Ali MK, Ranjani H, Mohan V. Regularity of follow-up, glycemic burden, and risk of microvascular complications in patients with type 2 diabetes: a 9-year follow-up study. *Acta Diabetol*. 2015;52(3):601–609. doi:10.1007/s00592-014-0701-0.
47. Atal S, Joshi R, Misra S, Fatima Z, Sharma S, Balakrishnan S, Singh P. Patterns of drug therapy, glycemic control, and predictors of escalation–non-escalation of treatment among diabetes outpatients at a tertiary care center. *J Basic Clin Physiol Pharmacol*. 2022;33(6):803–814. doi:10.1515/jbcpp-2021-0189.
48. Sahoo J, Mohanty S, Kundu A, Epari V. Medication adherence among patients of type II diabetes mellitus and its associated risk factors: a cross-sectional study in a tertiary care hospital of Eastern India. *Cureus*. 2022;14(12):e33074. doi:10.7759/cureus.33074.
49. Acharya AS, Gupta E, Prakash A, Singhal N. Self-reported adherence to medication among patients with type II diabetes mellitus attending a tertiary care hospital of Delhi. *J Assoc Physicians India*. 2019;67(4):26–29.
50. Mishra R, Sharma SK, Verma R, Kangra P, Dahiya P, Kumari P, Sahu P, Bhakar P, Kumawat R, Kaur R, Kaur R, Kant R. Medication adherence and quality of life among type-2 diabetes mellitus patients in India. *World J Diabetes*. 2021;12(10):1740–1749. doi:10.4239/wjd.v12.i10.1740.
51. Acharya KG, Shah KN, Solanki ND, Rana DA. Evaluation of antidiabetic prescriptions, cost and adherence to treatment guidelines: a prospective, cross-sectional study at a tertiary care teaching hospital. *J Basic Clin Pharm*. 2013;4(4):82–87. doi:10.4103/0976-0105.121653.
52. Shah S, Barot P, Patel H, Shukla A, et al. Assessment of medication adherence in diabetes mellitus patients at a tertiary care teaching hospital in India. *Cureus*. 2025;17(2):e78391. doi:10.7759/cureus.78391.