Libyan Journal of Medical Research
www.ljmr.ly/
eISSN:2413-6096

Original Article

DOI: https://doi.org/10.54361/LJMR.20.1.17

High prevalence of Obesity and Suboptimal Glycemic Control Among Patients with Type 2 Diabetes in Private Clinics of Tripoli, Libya: a cross-Sectional Study

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Abstract:
Background: Type 2 Diabetes Mellitus (T2DM) poses a significant public health challenge globally, with effective management being crucial to prevent long-term complications. Understanding the clinical profile and factors associated with glycemic control in specific regional settings is essential for optimizing care. **Aim:** The primary aim of this cross-sectional study was to describe the clinical and demographic characteristics of T2DM patients attending private outpatient clinics in Tripoli, Libya, and to determine the association between their prescribed treatment regimen and the achievement of glycemic control (HbA1c < 7%). **Methods:** A retrospective cross-sectional study was conducted using the medical records of 120 adult T2DM patients from a private outpatient clinic in Tripoli, Libya, between May and September 2025. Demographic data, Body Mass Index (BMI), diabetes duration, HbA1c level, and treatment regimen (Lifestyle only, Oral agents only, Insulin only, Combination therapy) were collected. The association between treatment regimen and glycemic control was assessed using the Chi-square test. **Results:** The cohort showed a high prevalence of excess body weight, with 83.3% of patients classified as overweight or obese. Overall, 63.3% of patients had uncontrolled diabetes (HbA1c ≥ 7%). A statistically significant association was found between the type of treatment regimen and glycemic control ($p = 0.024$). Patients on lifestyle-only treatment had the highest rate of control (57.1%), while those on insulin-only (22.2%) and Combination therapy (20%) had the lowest rates of control. **Conclusion:** This study highlights a high burden of obesity and suboptimal glycemic control among T2DM patients in this private clinical setting in Libya. The findings suggest that patients requiring more intensive therapies face greater challenges in achieving glycemic targets, underscoring the need for integrated weight management and enhanced support for adherence to complex treatment regimens.
Keywords: Type 2 Diabetes Mellitus; Glycemic Control; Treatment Regimen; Obesity; Body Mass Index; Libya; Cross-Sectional Study; HbA1c.

Introduction:
Type 2 Diabetes Mellitus (T2DM) represents a worldwide public health emergency, marked by incremental insulin resistance and diminished insulin release, resulting in persistently elevated blood sugar levels [1]. The occurrence of T2DM is steadily increasing globally, presenting a substantial strain on healthcare systems and personal quality of life [2]. Effective management of T2DM is essential to prevent or postpone the development of debilitating microvascular and macrovascular issues, which encompass retinopathy, nephropathy, neuropathy, and heart disease [3,4].
The foundation of T2DM management consists of a comprehensive strategy that encompasses changes in lifestyle, including nutrition and physical activity, as well as medication treatments, which vary from oral diabetes medications to insulin and combination therapies [5,6]. Attaining and sustaining ideal glycemic regulation, generally characterized by a goal glycated hemoglobin (HbA1c) level below 7.0%, is the main objective of therapy. Nonetheless, a significant number of patients find it challenging to achieve these goals, emphasizing an ongoing obstacle in clinical practice [7,8]. Research has indicated that despite improvements in therapy, glycemic control has deteriorated in recent years, emphasizing the importance of ongoing observation and tailored care approaches [3,9]
The clinical features of patients with T2DM show considerable variability and are markedly impacted by the advancement of disease and the results of management [10,11]. Elements like age, gender, length of diabetes, and body mass index (BMI) are essential factors of a clinical profile of the patient [12,13]. Significantly, the robust connection between T2DM and obesity is well-known, with a significant occurrence of being overweight and obese noted in worldwide diabetic populations [4,14]. This co-occurrence complicates treatment and heightens the likelihood of related complications [15].

Aim of the Study:
The primary aim of this cross-sectional study is twofold:

1. To describe the clinical and demographic characteristics (including age, sex, Body Mass Index, duration of diabetes, and Glycated Hemoglobin A1c level) of patients with Type 2 Diabetes Mellitus attending private outpatient clinics.
2. To determine the association between the prescribed treatment regimen (lifestyle only, oral agents only, insulin only, or combination therapy) and the achievement of glycemic control (defined as HbA1c < 7% vs. ≥ 7%) in this patient cohort.

Received: 24-12-2025-*Accepted:* 02-02-2026 -*Published:* 09-02-2026

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DOI: https://doi.org/10.54361/LJMR.20.1.17

Methods:

Study Design and Setting:

This was a cross-sectional study conducted at a private outpatient clinic specializing in endocrinology and diabetes management in Tripoli, Libya. The study was designed to describe the clinical and demographic characteristics of patients with Type 2 Diabetes Mellitus (T2DM) and to investigate the association between their prescribed treatment regimen and the achievement of glycemic control.

Study Population and Data Collection:

The study group comprised adult patients with T2DM who were visiting the private outpatient clinic for regular follow-up care. Data were gathered retrospectively from patient medical files over a duration of five months, from May 2025 to September 2025. A total of 120 patient records were incorporated into the final analysis, as outlined in the results Table 1. Demographic and Clinical Features: Age (classified as < 40, 40–59, and ≥ 60 years), gender (male/female), Body Mass Index (BMI) (classified as Normal < 25, Overweight 25–29.9, and Obese ≥ 30 kg/m²), and diabetes duration (classified as < 5, 5–10, and > 10 years).Treatment Plan: The present recommended management was divided into four categories: Lifestyle alone, Oral medications alone, Insulin alone, and Combination treatment (oral medications plus insulin).

Glycemic Control: Established according to the latest Glycated Hemoglobin A1c (HbA1c) assessment. Patients were categorized as Controlled if HbA1c was less than 7%, and Uncontrolled if HbA1c was 7% or greater.

Ethical approval:

The research was carried out in alignment with the ethical standards outlined in the Declaration of Helsinki. Ethical clearance and administrative authorization to access and examine patient medical records were secured from the Medical Management of the private outpatient clinic in Tripoli. To maintain patient confidentiality, all data were gathered retrospectively and anonymized, without any personal identifiers (like names or identification numbers) noted. A waiver for informed consent was approved because of the study's retrospective nature and the employment of anonymized clinical data solely for research purposes.

Statistical Analysis:

Descriptive statistics were employed to summarize the demographic and clinical features. Categorical variables were displayed as counts and proportions. The link between the treatment protocol and glycemic management was evaluated using the Chi-square test. A two-tailed P-value of < 0.05 was regarded as statistically meaningful. All statistical analyses were conducted using SPSS version 26.0.

Results

The analysis included 120 patient records in total. Table 1 summarizes the clinical characteristics of the study population. The vast majority of the patients fell within the age range of 40–59 years 51.7% followed by those aged ≥ 60 years, 33.3%. There was a slightly higher proportion of female patients 55% compared to male patients, 45%. Regarding Body Mass Index (BMI), a significant proportion of the cohort was either overweight 38.3% or obese 45%, with only 16.7% having a normal BMI. The duration of diabetes was less than 5 years for 40% of patients, while 23.3% had been living with the condition for more than 10 years.

In general, the study population exhibited suboptimal glycemic control, with 63.3% of patients having uncontrolled diabetes (HbA1c ≥ 7%), compared to 36.7% who achieved the target (HbA1c < 7%). The most common treatment regimen was oral agents only 48.3%, followed by combination therapy 25%.

Age, body mass index (BMI), and HbA1c were collected and analyzed as categorical variables and therefore were presented as frequencies and percentages rather than mean ± standard deviation. Consequently, mean ± SD values could not be calculated from the available dataset. Associations between categorical variables were assessed using the chi-square (χ^2) test, and both χ^2 statistic values and corresponding p-values were reported. A p-value < 0.05 was considered statistically significant.

Table 1. Clinical and Demographic Characteristics of Patients with Type 2 Diabetes Mellitus (n = 120)

Variable	N (%)
Age (years)	
< 40	18 (15)
40–59	62 (51.7)
≥ 60	40 (33.3)
Sex	
Female	66 (55)
Male	54 (45)
BMI (kg/m²)	
Normal (<25)	20 (16.7)
Overweight (25 – 29.9)	46 (38.3)
Obese (≥30)	54 (45)

Received: 24-12-2025-Accepted: 02-02-2026 -Published: 09-02-2026

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Duration of diabetes	
< 5 years	48 (40)
5–10 years	44 (36.7)
> 10 years	28 (23.3)
HbA1c level	
< 7% (Controlled)	44 (36.7)
≥ 7% (Uncontrolled)	76 (63.3)
Treatment regimen	
Lifestyle only	14 (11.7)
Oral agents only	58 (48.3)
Insulin only	18 (15)
Combination therapy	30 (25)

The association between the prescribed treatment regimen and the achievement of glycemic control is presented in Table 2. The Chi-square test revealed a statistically significant association between the type of treatment regimen and glycemic control ($\chi^2 = 9.40$, df = 3, P = 0.024). Patients on Lifestyle only treatment had the highest rate of glycemic control, with 57.1% achieving HbA1c < 7%. In contrast, individuals using solely insulin (77.8%) and combination therapy (80%) had the highest rates of uncontrolled diabetes (HbA1c ≥ 7%). Patients on Oral agents only showed a control rate of 44.8%.

Table 2. Association Between Glycemic Control and Treatment Regimen (n = 120)

Treatment regimen	Controlled HbA1c < 7% n (%)	Uncontrolled HbA1c ≥7% n (%)	P value
Lifestyle only	8 (57.1)	6 (42.9)	0.024*
Oral agents only	26 (44.8)	32 (55.2)	
Insulin only	4 (22.2)	14 (77.8)	
Combination therapy	6 (20)	24 (80)	
Total	44 (36.7)	76 (63.3)	

*There was a statistically significant association between treatment regimen and glycemic control (Chi-square test, p < 0.05).

Discussion

The current research offers an in-depth assessment of the clinical features and management strategies for patients diagnosed with Type 2 Diabetes Mellitus (T2DM) visiting privately operated outpatient clinics in Tripoli, Libya. Our results indicate a cohort mainly made up of middle-aged and older people, featuring a significant incidence of excess weight and obesity, along with inadequate glycemic regulation.

The demographic characteristics of our group indicate that 51.7% are between 40 and 59 years old, while 33.3% are aged ≥ 60 years, which corresponds with the worldwide and regional patterns of T2DM, which mainly impacts the older adults and senior citizens.

This aligns with findings from other Libyan studies. For example, Ashur et al. [16] observed a comparable age distribution in Tripoli. Additionally, our study showed a slight female predominance (55%) is a frequent finding in Libyan diabetes studies, possibly indicating elevated healthcare-seeking tendencies in women or an increased occurrence of metabolic risk elements within this category [17,18].

A notable result in our research is the significant occurrence of excess body weight, with 83.3% of patients classified as either overweight (38.3%) or obese (45%). These numbers are similar to the latest figures from Alwahda Teaching Hospital, where 55.6% of T2DM patients were overweight and 35.2% were obese [19]. Similarly, another study noted that 44.4% of diabetic individuals in Northwest Libya were classified as obese [20]. The strong association between obesity and T2DM in the Libyan population underscores the urgent need for integrated weight management strategies within diabetes care protocols, as obesity significantly complicates glycemic management and increases the risk of cardiovascular complications [14].

Regarding glycemic control, only 36.7% of our patients achieved the target HbA1c < 7%, while 63.3% exhibited suboptimal control. While this indicates a significant gap in management, it is slightly better than the 21.8% control rate reported by Ashur et al. in a large public diabetes center in Tripoli [16] and the 20.2% reported in Benghazi [21]. The relatively higher control rate in our study might be attributed to the private clinic setting, where patients may have better access to medications, more frequent followups, or higher socioeconomic status, which are known facilitators of better glycemic outcomes [22].

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Our analysis revealed a significant association between treatment regimens and glycemic control ($p = 0.024$). Patients managed with lifestyle modifications alone had the highest control rate (57.1%), likely reflecting those in the early stages of the disease with more preserved beta-cell function. In contrast, patients on insulin (22.2% control) or combination therapy (20% control) had the lowest rates of success. This "clinical inertia" or the use of more intensive therapies in patients with longer disease duration and more advanced complications is a well-documented phenomenon [16,23]. As diabetes progresses, the decline in insulin secretion often necessitates the transition from oral agents to insulin, yet many patients remain uncontrolled due to factors such as fear of hypoglycemia, complex dosing schedules, or inadequate titration [8].

Limitation:

The small sample size (n=120) and the single-center nature of the study limit the generalizability of the findings to the entire T2DM population in Tripoli or Libya. Future, larger, multi-center, prospective studies are warranted to confirm these findings and explore the underlying factors contributing to the observed associations.

Conclusion

This cross-sectional research involving T2DM patients at a private outpatient clinic in Tripoli, Libya, showed a high incidence of overweight and obesity (83.3%) along with a notable level of poor glycemic control (63.3%). A significant statistical correlation was identified between the intricacy of the treatment plan and the chance of uncontrolled diabetes, with those on insulin therapies exhibiting the poorest control levels. These results highlight the immediate necessity for improved, patient-focused management strategies in this context, emphasizing integrated weight management and addressing the challenges to effective glycemic control for patients needing intensive insulin or combination therapy.

Acknowledgments:

We would like to thank the administration and staff of the private outpatient clinic in Tripoli for their facilitation and support during data collection.

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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Received: 24-12-2025-*Accepted:* 02-02-2026 -*Published:* 09-02-2026

DOI: https://doi.org/10.54361/LJMR.20.1.17

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Received: 24-12-2025-*Accepted:* 02-02-2026 -*Published:* 09-02-2026