ORIGINAL ARTICLE

Semaglutide in Practice: Insights from a Retrospective Case Series at a Jharkhand Tertiary Care Hospital

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Abstract

Background: Semaglutide, a glucagon-like peptide-1 (GLP-1) receptor agonist, has demonstrated efficacy in improving glycemic control and reducing cardiovascular risk in patients with type 2 diabetes mellitus (T2DM). However, real-world evidence from Indian populations remains limited. This study aimed to assess the effectiveness and safety of semaglutide on glycemic control, body weight, and metabolic parameters in patients with T2DM in a real-world clinical setting. Methods: This retrospective observational study was conducted at a tertiary care hospital in Jharkhand, India, between February 2023 and August 2024. A total of 60 patients with T2DM (44 males and 16 females), including treatment-naïve individuals and those with inadequate glycemic control (HbA1c >7%) despite ongoing therapy, were enrolled. Clinical and biochemical parameters were evaluated at baseline and after six months of semaglutide therapy. Statistical analysis was performed using paired *t*-tests, with a *p*-value <0.05 considered statistically significant.Results: Significant improvements were observed following semaglutide therapy. Mean HbA1c decreased from 9.21% at baseline to 7.35% after six months (p <0.001). Mean body weight decreased by 2.6 kg (p <0.001). LDL cholesterol levels declined significantly from 92.03 mg/dL to 78.93 mg/dL (p <0.05). Renal parameters, including serum creatinine and urine albumin-to-creatinine ratio, showed numerical improvement; however, these changes did not reach statistical significance (p >0.05). Thyroid function remained stable throughout the study period. Improvements in diabetic retinopathy and neuropathy were also observed, although these findings were not statistically significant.

Conclusion: Semaglutide was effective and well tolerated in patients with T2DM in routine clinical practice. Treatment was associated with significant reductions in HbA1c, body weight, and LDL cholesterol without adverse effects on renal or thyroid function. These findings support the use of semaglutide as an effective therapeutic option for the management of T2DM in real-world settings.

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Introduction

Diabetes mellitus, a chronic metabolic disorder characterized by sustained hyperglycemia, represents one of the most formidable global public health challenges of the 21st century. This condition arises from defects in insulin secretion, insulin action, or a combination of both, leading to disturbances in carbohydrate, fat, and protein metabolism. The sheer scale of its prevalence and its escalating incidence rates, particularly in low- and middle-income countries, pose an immense burden on healthcare systems and national economies. The World Health Organization (WHO) provides stark projections, indicating a relentless rise in diabetes cases worldwide. India, often referred to as the "diabetes capital of the world," exemplifies this alarming trend. Projections indicate a substantial increase in the adult diabetic population in India, with numbers anticipated to soar from 77 million in 2017 to an estimated 134 million by 2045, highlighting an urgent need for effective therapeutic strategies and preventive measures.[1] The therapeutic landscape for type 2 diabetes mellitus (T2DM) has undergone significant evolution, moving beyond glucose lowering to encompass comprehensive cardiovascular and renal risk reduction. Glucagon-like peptide-1 (GLP-1) receptor agonists represent a class of medications that have revolutionized T2DM management because of their unique pleiotropic effects. These agents mimic the action of endogenous GLP-1, an incretin hormone released from the gut in response to food intake. Semaglutide, a highly effective and widely studied GLP-1 receptor agonist, stands out because of its prolonged half-life, allowing for convenient once-weekly subcutaneous administration (or daily oral formulation). Its mechanism of action is multifaceted: it enhances glucose-dependent insulin secretion from pancreatic beta cells, thereby lowering postprandial glucose levels; it suppresses inappropriately high glucagon secretion, which contributes to hepatic glucose production; it slows gastric emptying, promoting satiety and reducing postmeal glucose excursions; and critically, it acts on central nervous system pathways to reduce appetite and consequently promote significant weight loss. Beyond its direct glycemic effects, semaglutide has demonstrated substantial benefits in terms of cardiovascular outcomes and renal protection in large-scale clinical trials.

Despite the growing body of evidence from international clinical trials, real-world data from diverse geographical and clinical settings are crucial for understanding the effectiveness and generalizability of new therapies. This case series aims to contribute to this understanding by evaluating the real-world efficacy of semaglutide. Specifically, we sought to assess its impact on key metabolic parameters such as hemoglobin A1c (HbA1c), body weight, and associated comorbidities like dyslipidemia and early-stage renal dysfunction, in a cohort of patients receiving treatment at our tertiary care institution in Jharkhand, a region within India with its unique demographic and clinical characteristics. The insights gleaned from this retrospective analysis are intended to inform clinical practice and resource allocation within similar healthcare environments.

Methodology

Study Design

This investigation was designed as a retrospective, observational study. We systematically reviewed the medical records of patients diagnosed with T2DM who initiated semaglutide therapy within a defined period. The study period spanned from February 2023 to August 2024, during which data were meticulously collected from electronic health records and physical charts at our tertiary care hospital located in Jharkhand, India. The retrospective nature of the study allowed for the evaluation of treatment outcomes in a real-world clinical setting, reflecting routine patient care rather than the controlled environment of a clinical trial.

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Participants

The study cohort comprised 60 patients who met the inclusion criteria for initiation of semaglutide therapy for their diabetes management. Among these participants, 44 were males, and 16 were females, reflecting a demographic distribution common in our clinical practice. The inclusion criteria were broad to capture a representative real-world population, focusing on adults diagnosed with type 2 diabetes who were prescribed semaglutide. This included patients who were either treatment naive or those who had suboptimal glycemic control (HbA1c >7.0%) despite receiving other conventional antidiabetic medications such as metformin, sulfonylureas, or insulin. Exclusion criteria included patients with type 1 diabetes, pregnant or lactating women, individuals with a history of medullary thyroid carcinoma or multiple endocrine neoplasia syndrome type 2, severe gastrointestinal disease (e.g., gastroparesis), or known hypersensitivity to semaglutide. Ethical approval for the retrospective review of anonymized patient data was obtained from the institutional review board (IRB) of Tata Main Hospital, ensuring patient confidentiality and adherence to ethical research guidelines.

Data Collection

Patient charts were rigorously reviewed to extract comprehensive data on various parameters, both at baseline (i.e., immediately prior to the initiation of semaglutide treatment) and after a follow-up period of approximately 6 months postinitiation of therapy. The following key parameters were collected:

- Weight (kg): Body weight measurements were recorded to assess the impact of semaglutide on weight management.
- HbA1c (%): Glycated hemoglobin levels, a crucial indicator of long-term glycemic control, were recorded to evaluate treatment efficacy.
- Creatinine (mg/dL): Serum creatinine levels were assessed as an indicator of renal function.
- Urine albumin-to-creatinine ratio (UACR, mg/gm): This ratio was used to screen for and monitor microalbuminuria, an early marker of diabetic nephropathy.
- Thyroid-stimulating hormone (TSH, µIU/mL): TSH levels were recorded to evaluate thyroid function, particularly relevant given the association between diabetes and thyroid disorders.
- Low-density lipoprotein (LDL, mg/dL): LDL cholesterol levels were monitored to assess the impact of semaglutide on lipid profiles, an important cardiovascular risk factor.
- Diabetic neuropathy: The presence and severity of diabetic neuropathy were assessed based on documented composite neuropathy scores obtained from clinical examinations (e.g., vibration perception, monofilament testing) and patient symptom reporting at baseline and follow-up.
- Diabetic retinopathy: The status of diabetic retinopathy was assessed through documented ophthalmologic examinations, including fundoscopy or retinal imaging reports, noting any changes in severity during the study period.

All laboratory values were obtained from the hospital's central laboratory, ensuring standardized and calibrated measurements.

Statistical Analysis

All collected data were compiled and analyzed using appropriate statistical software (SPSS version 26.0). Descriptive statistics were used to summarize patient demographics and baseline clinical characteristics. To determine the statistical significance of changes in continuous variables from baseline to 6 months posttreatment, paired *t*-tests were employed. This statistical method is ideal for comparing means from the same subjects under two different conditions (before and after treatment). A two-tailed *p*-value of <0.05 was predefined as the threshold for statistical significance, indicating a low probability that the observed differences occurred by chance. Data integrity was maintained through careful entry and verification processes to minimize errors.

Results

The cohort's demographics and clinical characteristics at baseline are summarized, providing context for the observed outcomes. The mean age of the participants was 58.5 ± 9.2 years, with a mean duration of diabetes of approximately 7.3 ± 4.1 years. Comorbidities were prevalent, reflecting the complex clinical profile of patients with type 2 diabetes.

Glycemic Control and Weight Management

Analysis of the comprehensive dataset revealed a highly significant and clinically meaningful impact of semaglutide on glycemic control and body weight. The average weight reduction observed across the cohort was 2.6 kg ($p < 0.001$), signifying a statistically robust and encouraging trend toward weight loss. While this average might appear modest, it is significant in the context of T2DM management, where many conventional therapies lead to weight gain. This weight reduction would be visually represented in a bar chart, with distinct bars for "weight before" and "weight after" for each patient, clearly demonstrating the downward trend in individual weights. More strikingly, a profound improvement in glycemic control was evident, with the mean HbA1c level decreasing significantly from a baseline of 9.21% to a follow-up value of 7.35% ($p < 0.001$). This 1.86% absolute reduction in HbA1c is highly clinically relevant, bringing a substantial proportion of patients closer to or within individualized glycemic targets, thereby mitigating the risk of long-term diabetes complications. A line graph illustrating HbA1c levels would show two distinct lines, one for "before" and one for "after" treatment, running parallel but significantly lower for the "after" values, indicating a consistent improvement across the patient cohort.

Renal Function and Lipid Profile

The assessment of renal function, primarily through serum creatinine levels, demonstrated stability. The mean creatinine levels remained largely unchanged, averaging around 0.9 mg/dL ($p > 0.05$), indicating that semaglutide therapy did not adversely affect kidney function in this cohort. Furthermore, the average UACR showed an improvement from 14.58 to 12.43 mg/gm. Although this reduction suggests a positive trend toward diminished microalbuminuria, it did not reach statistical significance ($p > 0.05$) within the 6-month follow-up period. A notable improvement was observed in the lipid profile, specifically in LDL cholesterol levels. The average LDL was significantly reduced from a baseline of 92.03 to 78.93 mg/dL ($p < 0.05$). This statistically significant reduction in LDL, often referred to as "bad" cholesterol, is a critical positive outcome, as dyslipidemia is a major modifiable cardiovascular risk factor in patients with T2DM.

Thyroid Function

Thyroid-stimulating hormone levels showed no significant variance from baseline after 6 months of semaglutide treatment ($p > 0.05$). This finding is reassuring, as it indicates that semaglutide therapy did not interfere with thyroid function in this patient population. Most patients with preexisting hypothyroid conditions maintained their TSH levels within acceptable therapeutic ranges, suggesting that semaglutide is safe for use in patients with well-managed thyroid disorders.

Diabetic Complications (Neuropathy and Retinopathy)

Regarding chronic diabetic complications, a total of 60 patients were included in this analysis. Among them, eight patients exhibited documented improvements in the severity of

their diabetic retinopathy. These improvements were noted through ophthalmologic examinations, indicating a potential stabilization or regression of retinal damage in a subset of the cohort. Additionally, one patient experienced a discernible reduction in neuropathy symptoms, as reported clinically. While these improvements in microvascular complications are encouraging, they did not achieve statistical significance across the entire cohort within the relatively short 6-month observation period. The pie chart representing comorbidities would visually depict the distribution of conditions like hypertension, dyslipidemia, preexisting neuropathy, and retinopathy among the 60 patients, illustrating the overall burden of diabetes-related complications in the study population.

Discussion

Efficacy of Semaglutide in Glycemic Control and Weight Loss

Our findings from this real-world retrospective case series from Jharkhand robustly reinforce the established efficacy of semaglutide in managing type 2 diabetes. The observed average HbA1c reduction of 1.86% is a substantial clinical improvement, demonstrating semaglutide's potent glucose-lowering capabilities. This reduction is consistent with the findings from large-scale randomized controlled trials and meta-analyses, which have consistently reported significant HbA1c lowering with semaglutide across diverse patient populations and clinical settings.[2,3] Achieving such a significant reduction in HbA1c is critical for reducing the risk of both microvascular and macrovascular complications associated with prolonged hyperglycemia. Equally important is the observed average weight reduction of 2.6 kg. Obesity and overweight are pervasive comorbidities in T2DM, significantly contributing to insulin resistance, disease progression, and cardiovascular risk. The weight-reducing effect of semaglutide, mediated primarily through its impact on appetite regulation and gastric emptying, is a distinct advantage over many other antidiabetic medications that are often weight neutral or even promote weight gain. This dual benefit of improved glycemic control and weight loss positions semaglutide as a highly attractive therapeutic option, particularly for patients with T2DM and concomitant obesity or overweight. A recent meta-analysis further supports these findings, underscoring similar reductions in HbA1c and body weight among individuals treated with semaglutide across various clinical settings, validating our real-world observations.[2]

Impact on Comorbid Conditions

Beyond its direct effects on glucose and weight, GLP-1 receptor agonists, including semaglutide, have garnered considerable attention for their potential to confer cardiovascular and renal benefits. While our study's primary focus was not on hard cardiovascular outcomes, the significant reduction in LDL cholesterol levels (from 92.03 to 78.93 mg/dL) is a clinically meaningful finding. Lowering LDL cholesterol is a well-established strategy for mitigating cardiovascular risk, and this observed improvement adds another dimension to semaglutide's beneficial profile in diabetes management. Regarding renal function, our data suggest a remarkable stability in creatinine levels, with no evidence of acute kidney injury or deterioration over the 6-month follow-up period. This finding is particularly reassuring, especially in a population often burdened with preexisting comorbidities such as hypertension and diabetes, both of which can predispose to renal impairment. While the improvement in urine ACR did not reach statistical significance, the trend toward reduction (from 14.58 to 12.43 mg/gm) is promising and aligns with larger studies that have demonstrated renoprotective effects of GLP-1 receptor agonists, including reductions in albuminuria and preservation of kidney function over longer durations.[4] Our findings affirm the safety of semaglutide with respect to renal metrics, suggesting it does not compromise kidney function in patients with T2DM, even in the presence of existing renal vulnerabilities.

Improvements in Complications

The observed slight improvements in retinopathy severity in eight patients and the reduction in neuropathy symptoms in one patient, although not statistically significant in this small cohort over a short follow-up, warrant further careful exploration. Microvascular complications like retinopathy and neuropathy are debilitating sequelae of long-standing diabetes. It is well established that intensive glycemic control plays a pivotal role in preventing and slowing the progression of these complications.[5] Observational studies and larger clinical trials have suggested that improved glycemic control, as achieved with semaglutide, can indeed contribute to slowing the progression of microvascular complications.[5,6] While our findings are preliminary in this regard, they provide an intriguing signal that aligns with the broader understanding of diabetes management. Longer-term follow-up and larger cohorts are necessary to definitively ascertain the impact of semaglutide on the incidence and progression of these critical complications.

Limitations

Despite providing valuable real-world insights, this study is subject to several limitations inherent to its retrospective design. First, the retrospective nature means that data collection was reliant on preexisting medical records, which may have varying degrees of completeness and standardization. This limits the ability to control for all potential confounding variables and may introduce biases. Causal interpretations between semaglutide therapy and observed outcomes should therefore be made with caution; while strong associations were found, direct causality cannot be definitively proven. Second, the relatively small sample size of 60 patients, although valuable for a single-center case series, limits the statistical power and the generalizability of the findings to a broader population. Larger, multicenter studies would be required to confirm these observations and establish their applicability across diverse demographic and clinical contexts. Variations in the exact follow-up duration among patients, dictated by routine clinical practice rather than a strict research protocol, could also affect the consistency of results across the cohort. Furthermore, the absence of a control group (patients not on semaglutide) prevents direct comparison of outcomes with other therapeutic regimens. Lastly, the 6-month follow-up period is relatively short for assessing long-term effects, particularly regarding the progression of chronic complications or sustained weight management.

Conclusion

This retrospective case series from a tertiary care hospital in Jharkhand provides compelling real-world evidence supporting the efficacy and safety of semaglutide in the management of T2DM. The introduction of semaglutide therapy in our clinical practice appears to be highly effective in achieving significant improvements in glycemic control, as evidenced by a substantial reduction in HbA1c. Furthermore, it demonstrates a beneficial impact on weight management and leads to favorable changes in lipid profiles. Crucially, semaglutide was found to maintain stable renal function, an essential consideration in a patient population often susceptible to kidney complications. While preliminary, the observed trends in the improvement of microvascular complications like retinopathy and neuropathy are encouraging and warrant

further investigation. This manuscript details the experiences with semaglutide treatment in patients with type 2 diabetes within a real-world setting, combining clinical findings and implications for diabetes management in a resource-constrained region. The data collectively suggest positive health outcomes, underscoring semaglutide's role as a powerful and valuable addition to the therapeutic armamentarium for type 2 diabetes. However, it is imperative that future prospective studies with larger cohorts, longer follow-up durations, and more rigorous control groups be conducted. Such studies are necessary for comprehensive validation of these initial observations, to definitively ascertain the long-term efficacy and safety of semaglutide therapy, and to fully explore its significant clinical relevance in managing the multifaceted challenges of T2DM.

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Announcement

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