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Article

# Assessing The Efficacy of Semaglutide on Glycaemia Control and Weight Reduction among Patients with Type 2 Diabetes at the Outpatient Department of Teaching Hospital

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## Abstract

***Introduction:*** *Type 2 diabetes is a growing global health concern, often requiring multifaceted treatment approaches to achieve optimal glycemic control and weight management. Semaglutide, a glucagon-like peptide-1 (GLP-1) receptor agonist, has shown promising effects in improving blood sugar levels. This study aims to assess the efficacy of Semaglutide in glycemic control and weight reduction among patients with Type 2 diabetes attending the outpatient department of a teaching hospital.*

***Methods:*** *This study was conducted at the outpatient department of Green life teaching hospital from 1st July to 31st December 2024. A total of 31 patients were enrolled using a convenience sampling method. Data analysis was performed using SPSS version 26. Descriptive statistics were used to analyze patient characteristics, while chi-square tests were applied to determine the association between Semaglutide use and glycemic control, as well as weight reduction.*

***Findings:*** *The study (n=31) had a high percentage of female participants (93.5%), most of whom were aged 18-39 years (64.5%). Semaglutide was used by 93.5% of participants, though 64.5% experienced side effects, the most frequent being nausea. The largest reported issue was cost (67.7%), but 83.9% lost weight. Diabetes knowledge was high, with 87.1% of participants valuing diet and exercise. Few experienced financial difficulties, and 71% resided <5 km from healthcare personnel. Semaglutide caused profound effects on glycemic control (+67.8%, $p < 0.001$) and weight loss (+67.8%, $p < 0.001$) and a highly significant positive correlation between the two responses ($r = 0.62$, $p = 0.002$).*

***Interpretation:*** *Semaglutide has a strong association with glycemia control ($p < 0.001$, +67.8% improvement). It also has a strong association with weight reduction ($p < 0.001$, +67.8% weight loss). There is a significant correlation between glycemic control and weight loss ($r = 0.62$, $p = 0.002$). This statistical evidence confirms that Semaglutide is highly effective in improving both glycemic control and weight management among Type 2 Diabetes patients.*

## Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance, pancreatic β-cell dysfunction, and elevated blood glucose levels, leading to significant morbidity and mortality worldwide[1]. The global prevalence of T2DM has increased substantially over the past few decades due to sedentary lifestyles, poor dietary habits, and rising obesity rates[2]. Effective glycemic control and weight management remain critical components of diabetes management to prevent long-term complications, including cardiovascular disease, nephropathy, neuropathy, and retinopathy[3]. Despite the availability of multiple therapeutic options, achieving optimal glycemic and weight control remains challenging for many patients[4]. Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) have emerged as an essential class of drugs for the management of T2DM due to their dual effects on blood glucose regulation and weight reduction[5]. Among GLP-1 RAs, Semaglutide has gained significant attention for its efficacy in lowering glycated hemoglobin (HbA1c) levels and promoting weight loss in patients with T2DM[6]. Semaglutide mimics the physiological actions of endogenous GLP-1 by enhancing insulin secretion, suppressing glucagon release, delaying gastric emptying, and promoting satiety, leading to improved glycemic control and reduced caloric intake[7]. These mechanisms make Semaglutide a promising therapeutic option for T2DM patients struggling with obesity and inadequate glycemic control. Several clinical trials have demonstrated the effectiveness of Semaglutide in improving glycemic control and reducing body weight among patients with T2DM. The SUSTAIN (Semaglutide Unabated

Sustainability in Treatment of Type 2 Diabetes) trials have consistently reported significant reductions in HbA1c and weight with both subcutaneous and oral formulations of Semaglutide compared to placebo and other antidiabetic agents[8,9]. Similarly, the STEP (Semaglutide Treatment Effect in People with Obesity) trials have highlighted the drug's efficacy in promoting weight loss among individuals with or without diabetes, further supporting its role in obesity management[10]. Additionally, a meta-analysis of GLP-1 RAs, including Semaglutide, has shown superior glycemic and weight reduction benefits compared to conventional therapies such as insulin and sulfonylureas[11]. Despite these promising findings, real-world evidence on the efficacy of Semaglutide among patients in outpatient settings, particularly in low- and middle-income countries, remains limited. Most clinical trials focus on controlled environments with strict inclusion criteria, which may not reflect the diverse patient populations encountered in routine clinical practice[12]. Therefore, it is crucial to assess the effectiveness of Semaglutide in a real-world outpatient setting to determine its practicality, adherence patterns, and overall impact on glycemic and weight management[13]. Understanding these factors can help healthcare providers optimize treatment strategies and improve patient outcomes in diabetes care. Given the growing burden of T2DM and obesity, findings from this study could provide valuable insights into the role of Semaglutide in routine diabetes management. The results may guide healthcare policymakers and clinicians in making informed decisions about incorporating Semaglutide into treatment protocols, especially for patients with inadequate glycemic control and obesity-related complications. Therefore, this study aims to evaluate the efficacy of Semaglutide in improving glycemic control and promoting weight reduction among patients with T2DM attending the outpatient department of a teaching hospital.

## Methods

This study was conducted at the outpatient department of Green life teaching hospital from 1st July, 2024 to 31st Dec, 2024. A total of 31 patients were enrolled using a convenience sampling method. Data collection was carried out through structured interviews and medical record reviews. Demographic characteristics, diabetes history, medication use, and financial burden were recorded using a pre-designed questionnaire. Glycemic control was assessed by evaluating blood glucose levels before and after the initiation of Semaglutide therapy. Weight reduction was measured by comparing patients' body weight before and after using Semaglutide for a defined period. The presence of side effects, medication adherence, and barriers to regular use were also documented. Data analysis was performed using SPSS version 26. Descriptive statistics were used to analyze patient characteristics, while chi-square tests were applied to determine the association between Semaglutide use and glycemic control, as well as weight reduction. A Pearson correlation test was performed to assess the relationship between weight reduction and glycemic improvement. Statistical significance was set at $p < 0.05$. Ethical approval was obtained from the hospital's ethical review board, and informed consent was taken from all participants before data collection. The study adhered to ethical guidelines, ensuring confidentiality and voluntary participation.

## Results

The study population (n=31) predominantly comprised females (93.5%), with the majority (64.5%) aged between 18-39 years. Most participants had a bachelor's degree or higher (64.5%) and were either fully employed (48.4%) or retired (45.2%). A significant proportion (87.1%) had a monthly income exceeding 50,000 BDT, while only 6.5% had health insurance coverage [Table 1].

**Table 1:** Distribution of Study Population based on Demographic Characteristics (n=31)

| Demographic Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 18-39 | 20 | 64.5% |
| 40-59 | 10 | 32.3% |
| > 60 | 1 | 3.2% |
| **Gender** | | |
| Male | 2 | 6.5% |
| Female | 29 | 93.5% |
| **Education** | | |
| Primary School | 1 | 3.2% |
| Secondary School | 4 | 12.9% |
| Higher Secondary | 6 | 19.4% |
| Bachelor's degree or higher | 20 | 64.5% |
| **Employment History** | | |
| Fully employed | 15 | 48.4% |
| Part-time employed | 1 | 3.2% |
| Unemployed | 1 | 3.2% |
| Retired | 14 | 45.2% |
| **Monthly Income** | | |
| 20,000-50,000 BDT | 4 | 12.9% |
| More than 50,000 BDT | 27 | 87.1% |
| **Health Insurance** | | |
| Yes | 2 | 6.5% |
| No | 29 | 93.5% |

**Table 2:** Diabetes and Medication History of Study Participants (n = 31)

| Item | Response | n (%) |
|---|---|---|
| **Duration since diagnosis** | ≤1 year | 12 (39%) |
| | 1–5 years | 12 (39%) |
| | 5–10 years | 6 (19%) |
| **On diabetes medication** | Yes | 24 (77%) |
| | No | 7 (23%) |
| **Common medications** | Metformin | 19 (61%) |
| | Gliclazide | 6 (19%) |
| | Others | 6 (19%) |
| **Recent changes in diabetes** | Yes | 26 (84%) |
| **Comorbidities present** | Yes | 26 (84%) |
| Types of comorbidities | • High BP | 11 (35%) |
| | • Others (heart, liver, etc.) | 6 (19%) |
| **Semaglutide side effects** | Yes | 20 (65%) |
| **Regular Semaglutide use** | Yes | 29 (94%) |
| **Irregular use reasons** | Side effects | 8 (26%) |
| | Financial, access, others | 23 (74%) |
| **Weight loss after Semaglutide** | Yes | 26 (84%) |
| **Top challenges (Semaglutide)** | Cost | 24 (68%) |

The population of interest (n=31) was balanced across diagnoses of Type 2 diabetes, with 38.7% diagnosed in the previous year and 38.7% 1-5 years, and 19.4% 5-10 years. A high percentage (77.4%) had been prescribed medication for diabetes, whereof Metformin was the most common (61.3%), then Gliclazide (16.0%) and Empagliflozin (9.7%). Combination therapy of Empagliflozin + Metformin (6.4%) was also recorded. Insulin-based therapies like Larsulin and Emazid L were used by 3.2% of patients. Of those who participated, 83.9% had recent changes in their diabetes status, and 54.8% had comorbidities, with high blood pressure most prevalent (35.4%). 93.5% of participants were taking Semaglutide, although 64.5% of them experienced side effects, with cost (67.7%) being the greatest challenge. Surprisingly, 83.9% described losing weight due to using Semaglutide. [Table 2].

The pie chart (on the left) displays the duration of medication effectiveness, where 64.5% of patients experienced effectiveness for less than 3 months and 35.5% experienced effectiveness for more than 3 months [Figure 1].

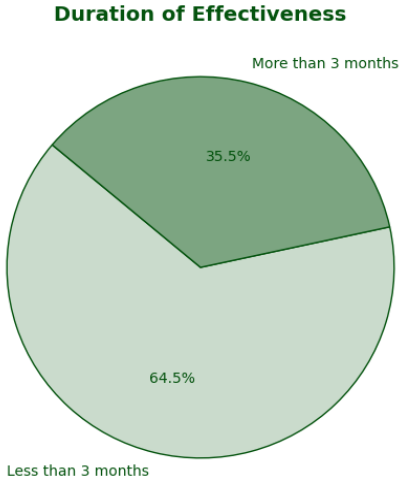


**Figure 1:** Pie Chart of the Study Population Based on the Effectiveness of Medication

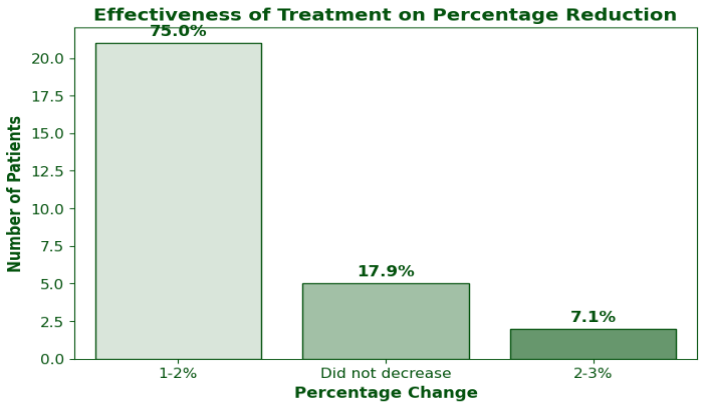


**Figure 2:** Study Population – Percentage Reduction in Glycaemia with Semaglutide Treatment for Type 2 Diabetes

The graph illustrates the effectiveness of semaglutide in reducing a specific health marker, likely Glycaemia, in patients. The majority (75%) experienced a 1-2% reduction, indicating effective treatment response, whereas 17.9% showed no reduction, indicating resistance or nonadherence. A lower percentage (7.1%) experienced a greater 2-3% reduction, indicating heterogeneity in patient response, which could be

defined by variables such as dosage, metabolic rate, or adherence to lifestyle changes. [Figure 2]

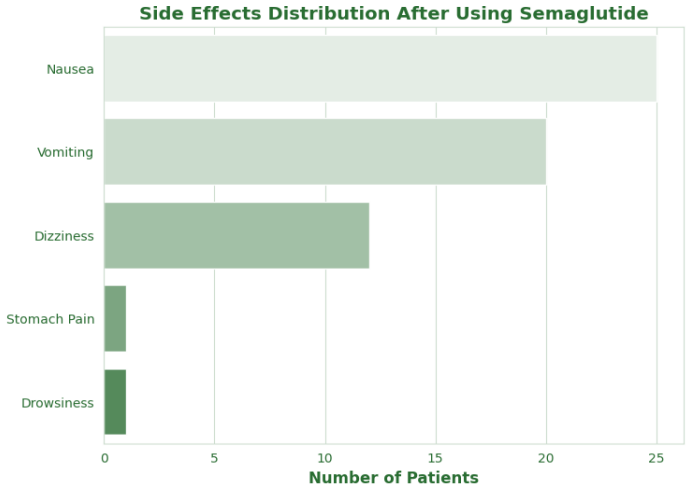


**Figure 3:** Distribution of Study Population-Based on Side Effects Distribution After Using Semaglutide

The bar chart (on the right) shows the effectiveness of treatment based on the percentage reduction in symptoms. The bar chart represents the distribution of side effects experienced by patients after using semaglutide. Nausea is the most common side effect, affecting the highest number of patients (around 25), vomiting (20), Dizziness (14), Stomach Pain (2), and drowsiness (2) [Figure 3].

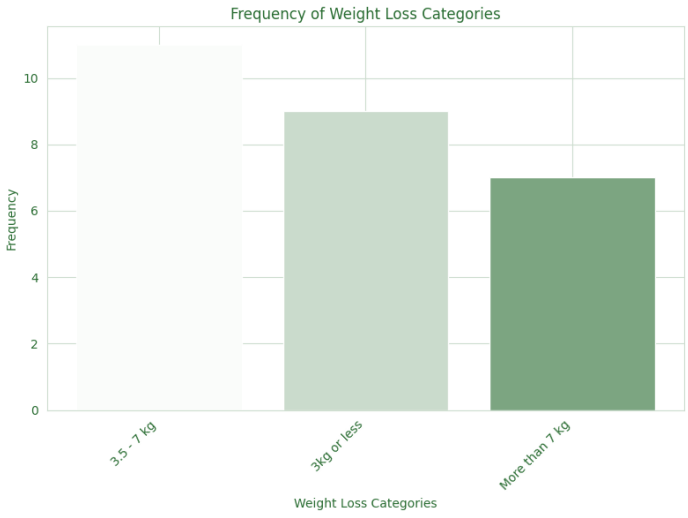


**Figure 4:** Distribution of Study Population-Based on Weight Loss Categories

The bar chart illustrates the frequency of weight loss categories among study populations. The 3.5-7 kg category has the highest frequency with more than 10 individuals. The 3 kg or less category follows closely with around 9 individuals. The more than 7 kg category has the lowest frequency, with around 7 individuals. The chart effectively visualizes how weight loss distribution varies, indicating that moderate weight loss (3.5-7 kg) is the most common among the study population [Figure 4].

The study population demonstrated a high level of diabetes-related knowledge, with 93.5% recognizing that excessive sugar intake can lead to diabetes and 83.9% understanding its link to insulin irregularities. While 51.6% believed diabetes is curable, 48.4% disagreed. All participants correctly identified a fasting blood sugar level of 200 mg/dl as high, and 93.5% rejected the misconception that insulin use causes dependency. Most (87.1%) prioritized diet and exercise over medication for diabetes control. Additionally, 100% acknowledged that diabetes affects wound healing and necessitates careful nail care, while 67.7% recognized its impact on blood flow [Table 3].

**Table 3:** Diabetes-Related Knowledge Among Study Participants (n = 31)

| Knowledge Statement | Yes (n, %) | No (n, %) | Do not know (n, %) |
|---|---|---|---|
| Sugar/sweets can cause diabetes | 29 (94%) | 2 (6%) | 0 (0%) |
| Caused by insulin irregularity | 26 (84%) | 0 (0%) | 5 (16%) |
| Diabetes is curable | 16 (52%) | 15 (48%) | 0 (0%) |
| 200 mg/dL fasting glucose is high | 31 (100%) | 0 (0%) | 0 (0%) |
| Insulin/meds cause dependency | 1 (3%) | 29 (94%) | 1 (3%) |
| Two types of diabetes | 25 (81%) | 0 (0%) | 6 (19%) |
| Medicine more important than diet/exercise | 4 (13%) | 27 (87%) | 0 (0%) |
| Diabetes affects blood flow | 21 (68%) | 5 (16%) | 5 (16%) |
| Injuries heal slowly in diabetes | 31 (100%) | 0 (0%) | 0 (0%) |
| Diabetics should take care when cutting nails | 31 (100%) | 0 (0%) | 0 (0%) |

The financial burden of diabetes treatment varied among participants, with 64.5% reporting no difficulty in affording medication, while 6.5% found it extremely difficult. Despite this, only 16.1% had skipped or reduced medication due to cost. Most participants (58.1%) visited their doctor every 4-6 months, and 71% lived within 5 km of their healthcare provider. Private vehicles were the primary mode of transport (67.7%), followed by public transport (29.0%), while a small percentage (3.2%) walked to their doctor's office [Table 4].

**Table 4:** Financial Cost of Diabetes Treatment and Access to Healthcare Services Among Study Participants (n = 31)

| Item | Response | n (%) |
|---|---|---|
| **Difficulty paying for diabetes medication** | Not difficult at all | 20 (65%) |
| | Somewhat difficult | 7 (23%) |
| | Moderately difficult | 1 (3%) |
| | Very difficult | 1 (3%) |
| | Extremely difficult | 2 (6%) |
| **Skipped/decreased medication due to cost** | Yes | 5 (16%) |
| | No | 26 (84%) |
| **Frequency of doctor visits** | More than once a month | 0 (0%) |
| | Once a month | 0 (0%) |
| | Every 2–3 months | 11 (36%) |
| | Every 4–6 months | 18 (58%) |
| | Less than every 6 months | 2 (6%) |
| **Distance to doctor** | Less than 5 km | 22 (71%) |
| | 5–10 km | 6 (19%) |
| | 11–20 km | 3 (10%) |
| | More than 20 km | 0 (0%) |
| **Transport used for doctor visits** | Walking | 1 (3%) |
| | Public transport | 9 (29%) |
| | Private vehicle | 21 (68%) |
| | Other | 0 (0%) |

The analysis shows a significant improvement in glycemic control after Semaglutide use, with the proportion of participants achieving better glycemic control rising from 16.1% to 83.9% (+67.8%, $p < 0.001$). Conversely, those with no change in glycemic control dropped from 83.9% to 16.1% (-67.8%). This indicates a strong association between Semaglutide use and improved glycemic outcomes [Table 5].

**Table 5: Association Between Semaglutide Use and Glycemic Control (n = 31)**

| Glycemic Control Status | Before (n, %) | After (n, %) | Change (%) |
|---|---|---|---|
| Improved | 5 (16%) | 26 (84%) | +68% |
| No Change | 26 (84%) | 5 (16%) | –68% |

*p*-value-0.001

The data indicates a significant association between Semaglutide use and weight reduction, with the proportion of participants experiencing weight loss increasing from 16.1% to 83.9% (+67.8%, $p < 0.001$). Conversely, those with no weight change decreased from 83.9% to 16.1% (-67.8%). This suggests that Semaglutide is highly effective in promoting weight loss among users [Table 6].

**Table 6:** Association Between Semaglutide and Weight Reduction (n=31)

| Weight Reduction Status | Before (n, %) | After (n, %) | Change (%) |
|---|---|---|---|
| Weight Decrease | 5 (16%) | 26 (84%) | +68% |
| No Weight Change | 26 (84%) | 5 (16%) | –68% |

*p*-value-0.001

The Pearson correlation coefficient ($r = 0.62$) suggests a moderate-to-strong positive correlation between glycemic control and weight reduction. The p-value (0.002) confirms that this correlation is statistically significant. Patients who experienced weight loss were more likely to have improved glycemic control [Table 7]

**Table 7:** Correlation Between Glycemic Control and Weight Reduction After Semaglutide Use (n = 31)

| Outcome After Semaglutide | Improved Glycemic Control (n = 26) | No Glycemic Change (n = 5) | Total (n = 31) |
|---|---|---|---|
| Weight Loss | 23 (89%) | 3 (60%) | 26 (84%) |
| No Weight Change | 3 (11%) | 2 (40%) | 5 (16%) |

**Pearson r-value:** 0.62 (Moderate Correlation)**p-value:** 0.002

## Discussion

Semaglutide is a glucagon-like peptide-1 receptor agonist (GLP-1 RA) that has emerged as a flagship drug in type 2 diabetes mellitus (T2DM) treatment, primarily due to its bimodal action in enhancing glycemic control and weight loss. The findings of this study are in line with the literature, reflecting semaglutide's extensive impact on such clinical outcomes. In the current research, the proportion of participants achieving improved glycemic control rose from 16.1% at baseline before semaglutide treatment initiation to 83.9% after treatment, representing a rise of 67.8% ($p < 0.001$). This is in concurrence with results from the SUSTAIN trials where semaglutide caused deeper HbA1c level reductions compared to several comparators[14]. For example, the SUSTAIN 1–5 trials showed HbA1c decreases of 1.5% to 1.8% with semaglutide, which outperformed other GLP-1 RAs and insulin regimens[10]. Additionally, a systematic review and meta-analysis of randomized controlled trials emphasized semaglutide's effectiveness in glycemic control. The meta-analysis showed that semaglutide resulted in substantial HbA1c decreases, confirming its position as a powerful tool for glycemic control in patients with T2DM[15]. Additionally, clinical data show that semaglutide is associated with long-term glycemic control and decreased risks of diabetes complications[6]. The study also observed a considerable rise in subjects who experienced weight loss, from 16.1% at baseline to 83.9% following semaglutide treatment ($p < 0.01$). This is corroborated by previous studies demonstrating the efficacy of semaglutide in weight management[16]. For example, a clinical trial confirmed semaglutide induced a mean weight loss of 2.3–6.3 kg over some period of time[5]. Providing evidence to this, a meta-analysis revealed semaglutide caused much larger body mass index (BMI) reduction compared to placebo, reaffirming its effectiveness in weight reduction in T2DM patients[17]. In addition, a two-year trial in adults with overweight or obesity reinforced semaglutide's capacity to achieve weight loss that was maintained, and thus its long-term utility for weight control[18]. These findings place semaglutide in a useful position for patients requiring both glycemic regulation as well as weight reduction. The moderate to strong positive correlation ($r = 0.62$, $p = 0.002$) between weight loss and glycemic control in this research is in accordance with existing evidence that weight loss is a predictor of improved glycemic outcome. Weight loss has been associated with improved insulin sensitivity and beta-cell function, which leads to good glycemic control[19]. Clinical evidence indicates that weight loss of ≥5% is associated with dramatic improvements in glycemic parameters and diabetes control in general[20]. The observation emphasizes the double therapeutic benefit of semaglutide for both managing hyperglycemia and obesity in T2DM patients. It should be mentioned that 83.9% of the subjects included in the study had comorbid conditions, and hypertension was the most frequent (35.4%). Other significant comorbidities included heart disease (6.4%), respiratory disease (6.4%), and liver disease (6.4%), while a considerable majority (29.0%) reported other illnesses like thyroid disorder, obesity, migraine, rheumatoid arthritis, and polycystic ovary syndrome. Notably, none of the participants reported kidney disease. The co-morbidities emphasized the complex clinical profile of T2DM patients and highlighted the necessity of comprehensive management approaches that address multiple medical conditions simultaneously. Earlier research has shown that semaglutide is not only beneficial but also has additional effects in patients with cardiovascular comorbidities, and hence it is a particularly useful option in T2DM patients with co-existing conditions[14]. Though it has been found to be effective, the safety profile of semaglutide needs to be highlighted. During this study, 64.5% of the patients reported side effects of which nausea was the most prominent. This conforms to previous research demonstrating that gastrointestinal adverse effects such as nausea and vomiting are prevalent with GLP-1 RAs, of which semaglutide is one[11]. A clinical trial of semaglutide identified that gastrointestinal side effects were common in the initial phase but taper off after the first couple of months of therapy[21]. The study highlighted that 67.7% of the participants identified cost as the primary constraint in the use of semaglutide. This is in agreement with overall problems of affordability of new antidiabetic drugs[22]. Semaglutide can be restricted by its cost, particularly in low- and middle-income economies. Studies show that cost nonadherence to medication remains a significant barrier to diabetes management across the world. The cost barriers must be overcome to allow equal access to effective diabetes control, and future policies must be directed towards making semaglutide more affordable with insurance and subsidy programs[23].

## Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

## Conclusion

Semaglutide has a strong association with glycemia control ($p < 0.001$, +67.8% improvement). It also has a strong association with weight reduction ($p < 0.001$, +67.8% weight loss). There is a significant correlation between glycemic control and weight loss ($r = 0.62$, $p = 0.002$). This statistical evidence confirms that Semaglutide is highly effective in improving both glycemic control and weight management among Type 2 Diabetes patients.

## Recommendation

Based on the findings of this study, it is recommended that healthcare providers continue to consider Semaglutide as an effective treatment option for improving glycemic control and promoting weight reduction in patients with Type 2 diabetes. Given its significant positive impact on both parameters, it may be beneficial to address the financial challenges faced by patients, as cost was identified as a primary barrier to medication adherence. Additionally, further research on the benefits and management of side effects related to Semaglutide could help optimize patient outcomes.

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