Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies *NLM ID: 101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Role of sustained release vildagliptin in patients with type 2 diabetes mellitus

[1]Sashidhar Reddy, [2]Neelam. I, [3]Repala Amulya, [4]Keren Darla, [5]Malothu Ravinder

[1]Associate Professor, Department of General Medicine, RVM Institute of Medical Sciences Hospital and Research Center, Hyderabad, Telangana, India;
[2]M Pharm, (PhD), Department of Pharmacy Practice, Geethanjali College of Pharmacy, RVM Institute of Medical Sciences and Research Center, Hyderabad, Telangana, India;
[3,4,5]Doctor of Pharmacy (Pharm D), Geethanjali College of Pharmacy, RVM Institute of Medical Sciences and Research Center, Hyderabad, Telangana, India

ABSTRACT:
Background: Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic condition characterized by hyperglycemia and insulin resistance. Sustained-release (SR) formulations like Vildagliptin 100 mg OD aim to improve glycemic control and medication adherence through once-daily dosing. **Objectives:** To assess the effect of sustained-release Vildagliptin on glycemic parameters (HbA1c, FBS, PPBS) and to evaluate medication adherence among T2DM patients over a three-month follow-up. **Methods:** A prospective, longitudinal, observational study was conducted over six months at a tertiary care center in Telangana. Ninety-six patients diagnosed with T2DM and receiving Vildagliptin SR 100 mg OD were enrolled. Data collection included demographic details, laboratory reports, and Medication Adherence Rating Scale (MARS) scores. Glycemic parameters were measured at baseline and after three months. Statistical analysis was performed using paired t-tests in SPSS v26. **Results:** Significant reductions were observed in mean HbA1c (from 7.99% to 6.62%, $p < 0.001$), FBS (from 173.76 to 138.33 mg/dL, $p < 0.001$), and PPBS (from 279.86 to 234.03 mg/dL, $p < 0.001$). Adherence was high, with 83.32% classified as adherent. **Conclusion:** Vildagliptin SR 100 mg OD is effective in improving glycemic control and enhancing medication adherence in T2DM patients.
Keywords: Vildagliptin SR, Type 2 Diabetes Mellitus, Glycemic Control, Medication Adherence, DPP-4 Inhibitors

Received: 22 October, 2024 Accepted: 25 November, 2024 Published: 10 December, 2024

Corresponding author: Keren Darla, Doctor of Pharmacy (Pharm D), Geethanjali College of Pharmacy, RVM Institute of Medical Sciences and Research Center, Hyderabad, Telangana, India

This article may be cited as: Reddy S, I Neelam, Amulya R, Darla K, Ravinder M. Role of sustained release vildagliptin in patients with type 2 diabetes mellitus. J Adv Med Dent Scie Res 2024; 12(12):120-126.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance (IR), impaired insulin secretion, or both. The disease poses a major global health concern due to its rising prevalence and associated complications such as retinopathy, nephropathy, neuropathy, cardiovascular diseases, and impaired quality of life [1]. According to international estimates, over 537 million adults were living with diabetes in 2021, and this number is projected to rise significantly in the coming decades. In India, over 74 million individuals are affected, positioning the country as a global epicenter for diabetes burden [2].

T2DM is primarily driven by a combination of genetic and environmental factors. Obesity, sedentary lifestyles, poor dietary habits, and advancing age contribute significantly to the pathogenesis of T2DM [1]. At the cellular level, IR and β-cell dysfunction disrupt glucose homeostasis, resulting in elevated fasting and postprandial blood glucose levels. IR leads to excessive hepatic glucose production and decreased glucose uptake in skeletal muscles and adipose tissue, while β-cell failure impairs adequate insulin secretion [2].

Pharmacological treatment is essential in managing T2DM when lifestyle modifications are insufficient. The American Diabetes Association and other global bodies recommend a stepwise approach using various

oral antidiabetic agents such as biguanides, sulfonylureas, α-glucosidase inhibitors, thiazolidinediones, and dipeptidyl peptidase-4 (DPP-4) inhibitors [1]. Among these, DPP-4 inhibitors, also known as gliptins, have gained prominence due to their glucose-dependent mechanism of action, favorable side effect profile, and low risk of hypoglycemia [3].

Vildagliptin is a potent, selective DPP-4 inhibitor that enhances incretin hormone activity, particularly glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP), leading to increased insulin secretion and suppressed glucagon levels in a glucose-dependent manner [3,4]. This dual action contributes to improved glycemic control by reducing fasting blood glucose (FBS), postprandial blood sugar (PPBS), and HbA1c levels [3,5]. Moreover, sustained-release (SR) formulations of Vildagliptin offer the advantage of once-daily dosing, which may enhance patient adherence and improve therapeutic outcomes [4].

Multiple clinical studies have demonstrated the efficacy and safety of Vildagliptin SR 100 mg in patients with T2DM. A randomized trial comparing Vildagliptin SR 100 mg once daily with Vildagliptin 50 mg twice daily reported similar glycemic reductions, with improved patient compliance noted in the SR group [4]. Furthermore, Vildagliptin has been shown to reduce glycemic variability, which is a significant predictor of long-term diabetic complications [6].

Adherence to prescribed medication is a critical determinant of therapeutic success in chronic diseases like diabetes. Studies suggest that fixed-dose combinations or once-daily regimens, such as Vildagliptin SR, are associated with better adherence compared to multiple-dose therapies [5,7]. Additionally, the use of Vildagliptin has been linked to reduced healthcare costs and improved work productivity due to better glycemic control and fewer complications [8,9].

Despite these benefits, economic constraints and access to healthcare services remain significant barriers in achieving optimal glycemic control, especially in low- and middle-income countries [10]. Therefore, assessing the real-world impact of Vildagliptin SR on glycemic parameters and medication adherence can provide valuable insights into its role in effective diabetes management.

MATERIALS AND METHODS

Study Design and Setting

This was a **prospective, longitudinal, observational study** conducted over a period of **six months** (July 2023 to January 2024) at **RVM Hospital**, a private teaching hospital located in **Laxmakkapally, Siddipet district, Telangana**, in collaboration with **Geethanjali College of Pharmacy, Cheeryal**.

Ethical Approval

The study protocol was reviewed and approved by the **Institutional Review Board (IRB)** of Geethanjali College of Pharmacy, Keesara, Telangana (IRB Approval Number not disclosed). Informed consent was obtained from all study participants prior to data collection, and confidentiality was maintained throughout the research.

Study Population and Sample Size

A total of **96 patients** diagnosed with **Type 2 Diabetes Mellitus (T2DM)** were enrolled from the outpatient general medicine department. Patients were selected based on the following criteria:

Inclusion Criteria

- Patients aged **≥25 years**.
- Diagnosed with **T2DM**.
- On treatment with **Vildagliptin SR 100 mg OD**.
- With or without comorbid conditions.

Exclusion Criteria

- **Pregnant or lactating women**.
- **Pediatric patients (<18 years)**.
- Patients with **HIV** or **HBsAg** positivity.
- Patients presenting to the **emergency department**.

Although the Raosoft sample size calculator recommended a sample size of 377 (95% confidence level, 5% margin of error, 50% response distribution), time constraints limited the final sample to **96 subjects**.

Data Collection Procedure

Clinical data were collected using a **structured patient data form**, which included:

- Demographic details.
- Medical and medication history.
- **Laboratory investigations** (HbA1c, Fasting Blood Sugar [FBS], Post-Prandial Blood Sugar [PPBS]).
- **Socio-economic classification**.
- **Medication adherence scores**, measured using the **Medication Adherence Rating Scale (MARS)**.

Data sources included:

- OPD records.
- Laboratory test reports.
- Patient interviews.
- Telephonic follow-ups.

Two time points were assessed:

- **Baseline** (at enrollment).
- **Follow-up** (after three months of Vildagliptin SR 100 mg OD therapy).

Assessment Tools

- **Glycemic Parameters**:
  - **HbA1c (%):** Measured to assess average blood glucose over the past 2–3 months.

- **FBS (mg/dL)** and **PPBS (mg/dL):** Measured using standard biochemical assays.
- **Medication Adherence**:
- Measured using the **10-item MARS questionnaire**.
- Adherence categories: Strongly adherent, Adherent, Likely adherent, Likely non-adherent, Non-adherent.
- **Socio-Economic Status**:
- Classified into classes II, III, and IV based on patient income and other household factors.

Statistical Analysis

All collected data were compiled using **Microsoft Excel** and statistically analyzed using **SPSS version 26.0**. Descriptive statistics were applied to calculate **means**, **standard deviations (SD)**, and **standard errors (SE)**. The **paired Student's t-test** was used to compare glycemic parameters between the baseline and follow-up values.

- A **p-value < 0.001** was considered statistically significant.
- Graphical representations were prepared using **bar charts** and **pie charts** for visual analysis of age, gender, socio-economic class, and adherence levels.

RESULTS

Table 1: Age Distribution

The study population consisted of 96 patients with Type 2 Diabetes Mellitus, stratified across various age groups. The largest subset of patients (26.0%) belonged to the **40–50 years** age group, followed by 22.9% in the **50–60 years** category. Patients aged **60–70 years** represented 16.7% of the sample, while **15.6%** were aged **70 and above**. Only **6.3%** of the subjects were below 30 years. This indicates that the highest prevalence of T2DM in this study was among **middle-aged and elderly individuals**, supporting epidemiological evidence that age is a significant risk factor in the development and progression of T2DM.

Table 2: Gender Distribution

Among the 96 participants, **62 were female (64.6%)** and **34 were male (35.4%)**, suggesting a female predominance in this cohort. This finding may reflect demographic and care-seeking behavior patterns in the study setting, as well as a potentially higher burden of diabetes in women attending the OPD of the participating hospital. The data align with previous regional studies indicating increasing diabetes prevalence in women, particularly in urban Indian populations.

Table 1: Age Distribution

Age in Years	No. of Cases	Percentage
< 30	6	6.3%
30 – 40	12	12.5%
40 – 50	25	26.0%
50 – 60	22	22.9%

Table 3: Statistical Analysis of HbA1c

This table highlights the impact of sustained-release Vildagliptin on long-term glycemic control. Among 84 patients who completed follow-up, the **mean HbA1c value decreased significantly from 7.99% at baseline to 6.62% after three months** of therapy. The standard deviation was nearly identical at both time points (±1.08), and the **paired t-test yielded a value of 29.938 with a p-value < 0.001**, confirming a **highly statistically significant reduction** in HbA1c levels. This reduction (1.37%) indicates that Vildagliptin SR effectively improves overall glycemic control in T2DM patients over a short-term period.

Table 4: Statistical Analysis of Fasting Blood Sugar (FBS)

The study also assessed short-term fasting glycemic control through FBS measurements in 87 patients. The **mean FBS decreased from 173.76 mg/dL at baseline to 138.33 mg/dL** at follow-up. The difference of approximately **35.43 mg/dL** was statistically significant (**t = 24.28, p < 0.001**), indicating a consistent improvement in fasting glucose control following Vildagliptin SR therapy. The results reinforce the therapeutic role of DPP-4 inhibitors in controlling basal insulin secretion and fasting hyperglycemia.

Table 5: Statistical Analysis of Post-Prandial Blood Sugar (PPBS)

Among 84 patients, **mean PPBS levels dropped from 279.86 mg/dL to 234.03 mg/dL**, showing a significant **decrease of 45.83 mg/dL** over three months. The paired t-test result (**t = 26.82, p < 0.001**) confirmed that this reduction was highly significant. These results support the efficacy of sustained-release Vildagliptin in improving post-meal glycemic excursions by modulating incretin pathways and delaying gastric emptying.

Table 6: Medication Adherence Based on MARS

Medication adherence was evaluated using the Medication Adherence Rating Scale (MARS) among 84 follow-up patients. The majority of patients were found to be adherent: **32.14% strongly adherent**, **33.33% adherent**, and **17.85% likely adherent**, collectively making up **83.32%** of the study population. In contrast, only **14.28% were likely non-adherent** and **2.3% non-adherent**. These findings suggest that once-daily sustained-release Vildagliptin enhances treatment compliance, likely due to its simplified dosing schedule and tolerable side-effect profile. Improved adherence may have contributed to the observed glycemic improvements.

60 – 70	16	16.7%
70 and Above	15	15.6%
Total	**96**	**100.0%**

Table 2: Gender Distribution

Gender	No. of Cases	Percentage
Male	34	35.4%
Female	62	64.6%
Total	**96**	**100%**

Table 3: Statistical Analysis of HbA1c

Visit	Mean	N	Std. Deviation	Std. Error Mean	t-value	p-value
1st Visit	7.99	84	1.08219	0.11808	29.938	<0.001
2nd Visit	6.62	84	1.08476	0.11836		

Table 4: Statistical Analysis of FBS

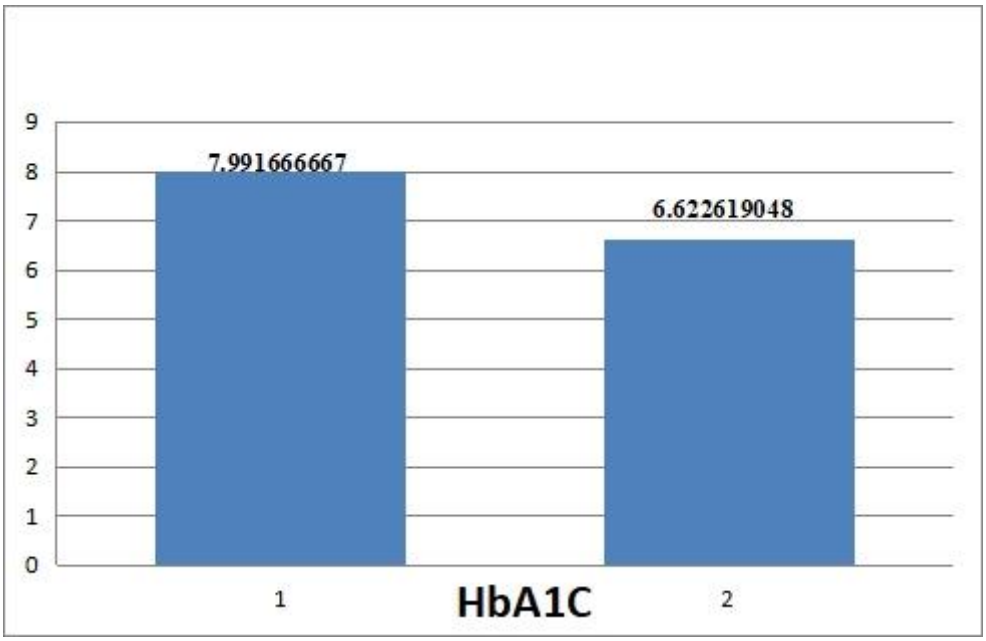
Visit	Mean	N	Std. Deviation	Std. Error Mean	t-value	p-value
1st Visit	173.76	87	26.65	2.91	24.2849	<0.001
2nd Visit	138.33	87	28.21	3.08		

Table 5: Statistical Analysis of PPBS

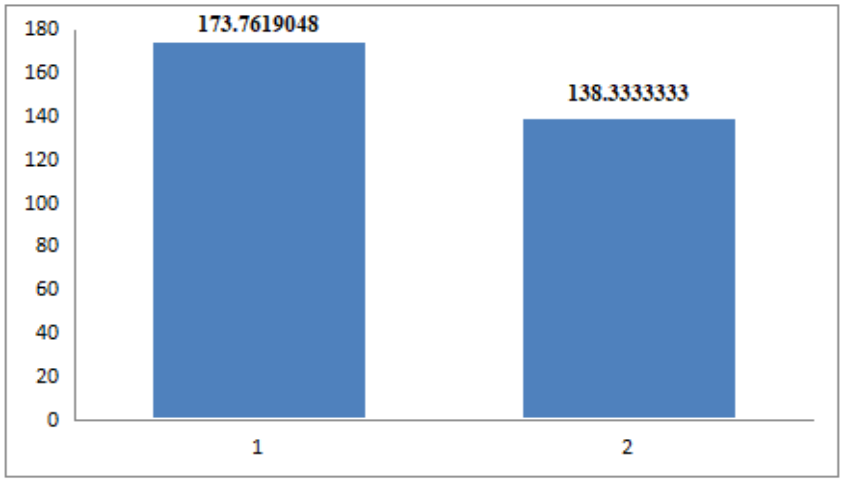
Visit	Mean	N	Std. Deviation	Std. Error Mean	t-value	p-value
1st Visit	279.86	84	47.73	5.21	26.8236	<0.001
2nd Visit	234.03	84	45.19	4.93		

Table 6: Medication Adherence Based on MARS

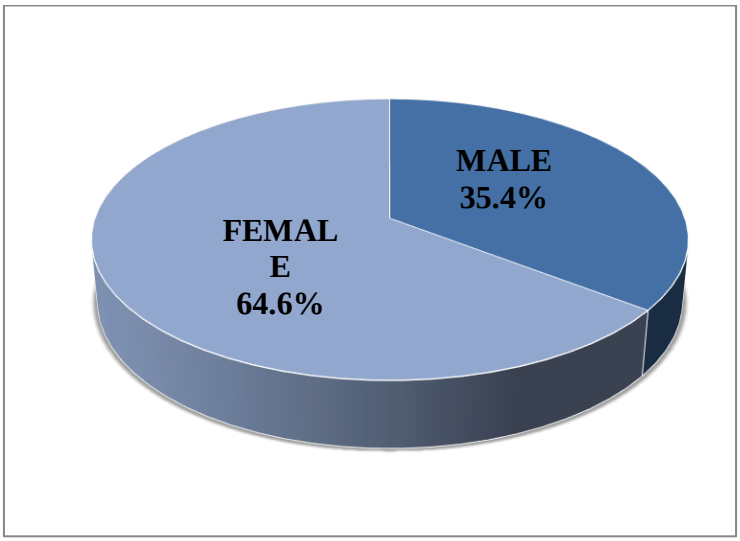
MARS Category	No. of Cases	Percentage
Strongly Adherent	27	32.14%
Adherent	28	33.33%
Likely Adherent	15	17.85%
Likely Non-Adherent	12	14.28%
Non-Adherent	2	2.3%
Total	**84**	**100%**



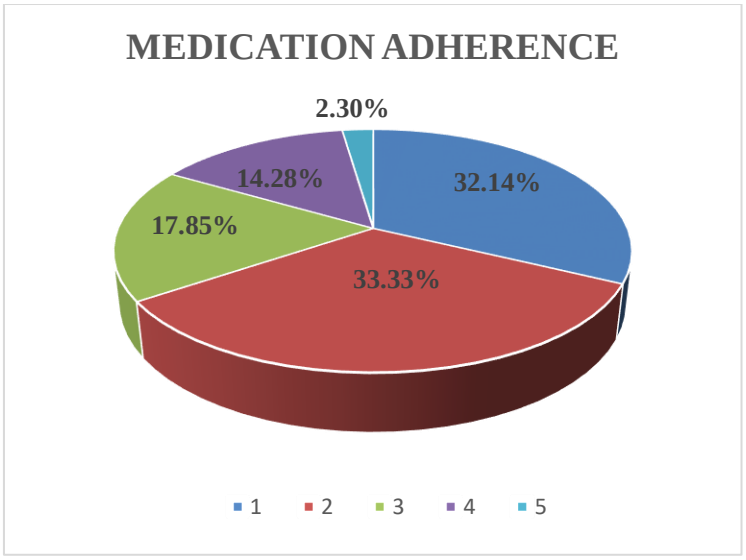
Graph 1: HbA1c Levels (Before and After Treatment)



Graph 2: FBS Levels (Before and After Treatment)



Pie Chart 1: Gender Distribution



Pie Chart 2: Medication Adherence Levels

DISCUSSION

The present prospective observational study evaluated the effect of sustained-release (SR) Vildagliptin 100 mg once daily on glycemic indices—namely HbA1c, fasting blood sugar (FBS), and post-prandial blood sugar (PPBS)—in patients diagnosed with Type 2 Diabetes Mellitus (T2DM). In addition, the study explored patterns of medication adherence among patients and assessed socio-economic factors that may influence treatment compliance. The findings revealed a statistically significant reduction in all three glycemic parameters over the course of three months, accompanied by a relatively high rate of medication adherence. These results corroborate existing literature supporting the efficacy and tolerability of Vildagliptin SR in the management of T2DM.

The reduction in **HbA1c levels** from 7.99% at baseline to 6.62% at follow-up represents a mean difference of approximately 1.37%, which was highly significant ($p < 0.001$). This finding aligns with the outcomes of a randomized, open-label phase IV study by Paul et al., which demonstrated that both Vildagliptin 50 mg twice daily and Vildagliptin SR 100 mg once daily effectively reduced HbA1c levels when added to metformin therapy. However, the once-daily sustained-release formulation exhibited superior patient convenience and tolerability without compromising efficacy [11]. Similarly, Sridhar et al. reported that Vildagliptin SR provided consistent DPP-4 inhibition and achieved comparable glycemic reductions as standard-dose Vildagliptin, thereby offering a promising therapeutic alternative with reduced dosing frequency [12].

In terms of **FBS control**, our study observed a reduction from 173.76 mg/dL to 138.33 mg/dL, with a statistically significant mean difference of approximately 35.4 mg/dL. These values are consistent with the findings of Paul et al., who documented similar improvements in fasting glycemic indices across both SR and conventional dosing regimens [11]. The ability of Vildagliptin to suppress glucagon secretion and enhance glucose-dependent insulin release contributes significantly to the stabilization of fasting glucose levels, a critical factor in preventing long-term microvascular complications in T2DM patients [13].

Additionally, **post-prandial glucose levels** showed a mean reduction of 45.83 mg/dL in the current study, a result that is both clinically and statistically significant. This outcome is in agreement with Marfella et al., who compared Vildagliptin and Sitagliptin in T2DM patients inadequately controlled on metformin and found that both agents significantly improved PPBS and overall glycemic variability, with Vildagliptin exhibiting better control of 24-hour glucose fluctuations [14]. The postprandial benefits of Vildagliptin can be attributed to its ability to delay gastric emptying and prolong the activity of incretin hormones, especially GLP-1, which enhances post-meal insulin secretion while reducing hepatic glucose production [15].

A notable aspect of this study was the evaluation of **medication adherence** using the Medication Adherence Rating Scale (MARS). Among the 84 patients who completed follow-up, 83.32% were classified as adherent, which included strongly adherent (32.14%), adherent (33.33%), and likely adherent (17.85%) groups. This supports previous work by Rombopoulos et al., who found higher compliance in patients receiving fixed-dose combinations of Vildagliptin and Metformin compared to those on separate doses [16]. Simplifying the medication regimen, such as through the use of once-daily SR formulations, has been shown to improve adherence and persistence in chronic disease management, especially in diabetes where polypharmacy is common [17].

The current findings also reveal the **influence of socio-economic status** on adherence. Among the 12 patients (12.5%) who dropped out or failed to attend follow-up, the majority were from lower socio-economic classes (Class IV). This mirrors findings by Genovese et al., who highlighted the impact of treatment costs on patient-reported outcomes, including work productivity and adherence [18]. Limited affordability and financial instability in lower economic groups often impede consistent access to medication, thereby compromising treatment outcomes.

The results of this study reinforce the value of **real-world evidence** in assessing the clinical effectiveness of newer formulations like Vildagliptin SR. Clinical trials often operate in highly controlled environments and may not capture adherence behavior or socio-economic barriers as effectively. Our study complements controlled trials by presenting outcomes in a routine clinical setting, which is more reflective of day-to-day patient experiences.

While the current investigation produced promising results, certain limitations must be acknowledged. The sample size was relatively small (n=96), and the study duration (three months) may not fully capture long-term efficacy or safety concerns. Additionally, the study lacked a comparator arm with conventional Vildagliptin or other DPP-4 inhibitors, which could have strengthened the interpretation of relative effectiveness. Despite these limitations, the significant reductions in glycemic indices and the high adherence rates suggest that Vildagliptin SR is both an effective and feasible option for glycemic control in T2DM, especially in patients who prefer once-daily regimens.

CONCLUSION

The present study demonstrated that sustained-release Vildagliptin 100 mg once daily significantly improves glycemic parameters—HbA1c, fasting blood sugar (FBS), and post-prandial blood sugar (PPBS)—in patients with Type 2 Diabetes Mellitus over a three-month period. Additionally, a high level of medication

adherence was observed, indicating the advantage of simplified once-daily dosing. Socio-economic barriers were noted as a limiting factor in treatment continuity for some patients. Overall, Vildagliptin SR proves to be an effective and well-tolerated therapeutic option for improving glycemic control and adherence in real-world clinical settings.

REFERENCES

1. Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM. Pharmacotherapy: a pathophysiologic approach. Connecticut: Appleton and Lange; 2014.
2. Kasina SVSK, Baradhi KM. Dipeptidyl Peptidase IV (DPP IV) Inhibitors. [Updated 2023 May 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK542331/.
3. Sridhar GR, Pandit K, Warrier S, Birla A. Sustained-Release Vildagliptin 100 mg in Type 2 Diabetes Mellitus: A Review. Cureus. 2023 May 18;15(5).
4. Paul R, Ghosh A, Sengupta N, Sahana PK. Comparison of efficacy and safety of vildagliptin 50 mg tablet twice daily and vildagliptin 100 mg sustained release once daily tablet on top of metformin in Indian patients with Type 2 diabetes mellitus: A randomized, open-label, Phase IV parallel-group, clinical trial. Natl J Physiol Pharm Pharmacol. 2022;12(8):1229-34.
5. Rombopoulos G, Hatzikou M, Athanasiadis A, Elisaf M. Treatment compliance with the fixed-dose combination of vildagliptin/metformin in patients with type 2 diabetes mellitus inadequately controlled with metformin monotherapy: a 24-week observational study. Int J Endocrinol. 2015 May 19;2015.
6. He YL, Foteinos G, Neelakantham S, et al. Differential effects of vildagliptin and glimepiride on glucose fluctuations in patients with type 2 diabetes mellitus assessed using continuous glucose monitoring. Diabetes Obes Metab. 2013;15(12):1111-9.
7. Genovese S, Tedeschi D. Effects of vildagliptin/metformin therapy on patient-reported outcomes: work productivity, patient satisfaction, and resource utilization. Adv Ther. 2013;30:B152-64.
8. Marfella R, Barbieri M, Grella R, et al. Effects of vildagliptin twice daily vs. sitagliptin once daily on 24-hour acute glucose fluctuations. J Diabetes Complications. 2010;24(2):79-83.
9. Sridhar GR, Pandit K. Economic aspects of diabetes care in India. Cureus. 2023;15(5).
10. Paul R, Sahana PK. Barriers to diabetes care in low-income Indian settings. Natl J Physiol Pharm Pharmacol. 2022;12(8):1235-8.
11. Paul R, Ghosh A, Sengupta N, Sahana PK. Comparison of efficacy and safety of vildagliptin 50 mg tablet twice daily and vildagliptin 100 mg sustained release once daily tablet on top of metformin in Indian patients with Type 2 diabetes mellitus: A randomized, open-label, Phase IV parallel-group, clinical trial. National Journal of Physiology, Pharmacy and Pharmacology. 2022;12(8):1229–34.
12. Sridhar GR, Pandit K, Warrier S, Birla A. Sustained-Release Vildagliptin 100 mg in Type 2 Diabetes Mellitus: A Review. Cureus. 2023 May 18;15(5):e38978.
13. Kasina SV, Baradhi KM. Dipeptidyl Peptidase IV (DPP IV) Inhibitors. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
14. Marfella R, Barbieri M, Grella R, Rizzo MR, Nicoletti GF, Paolisso G. Effects of vildagliptin twice daily vs. sitagliptin once daily on 24-hour acute glucose fluctuations. Journal of Diabetes and its Complications. 2010;24(2):79–83.
15. He YL, Foteinos G, Neelakantham S, Mattapalli D, Kulmatycki K, Forst T, Taylor A. Differential effects of vildagliptin and glimepiride on glucose fluctuations in patients with type 2 diabetes mellitus assessed using continuous glucose monitoring. Diabetes Obes Metab. 2013;15(12):1111–9.
16. Rombopoulos G, Hatzikou M, Athanasiadis A, Elisaf M. Treatment compliance with the fixed-dose combination of vildagliptin/metformin in patients with type 2 diabetes mellitus inadequately controlled with metformin monotherapy: a 24-week observational study. Int J Endocrinol. 2015;2015:1–7.
17. Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM. Pharmacotherapy: a pathophysiologic approach. 4th ed. Connecticut: Appleton and Lange; 2014. p.141.
18. Genovese S, Tedeschi D. Effects of vildagliptin/metformin therapy on patient-reported outcomes: work productivity, patient satisfaction, and resource utilization. Adv Ther. 2013;30:B152–64.
19. Sridhar GR, Pandit K. Economic aspects of diabetes care in India. Cureus. 2023;15(5):e39012.
20. Paul R, Sahana PK. Barriers to diabetes care in low-income Indian settings. National Journal of Physiology, Pharmacy and Pharmacology. 2022;12(8):1235–8.