

Original Research Article

Glycaemic durability and compliance among type 2 diabetes mellitus patients from India: results from the companion survey

Sanjay Kalra^{1*}, Vaishali Deshmukh², Ameya Joshi³, Sameer Agarwal⁴,
Manash P. Baruah⁴, Rakesh Sahay⁵

¹Bharti Hospital, Karnal, Haryana, India

²Deshmukh Clinic and Research Centre, Pune, Maharashtra, India

³Endocrine Clinic, Bhaktivedanta Hospital and Research Institute, Mumbai, Maharashtra, India

⁴Apex Plus Super-Specialty Hospital, Model Town, Rohtak, Haryana, India

⁵Excelcare Hospitals, Guwahati, Assam, India

⁶Osmania Medical College and Aster Prime Hospital, Hyderabad, Telangana, India

Received: 05 July 2024

Revised: 02 September 2024

Accepted: 04 September 2024

*Correspondence:

Dr. Sanjay Kalra,

E-mail: brideknl@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The COMPANION research survey was conducted to understand glycaemic durability and compliance with existing care among type 2 diabetes mellitus (T2DM) patients in India.

Methods: The cross-sectional observational survey enrolled 367 physicians; each physician responded to a questionnaire based on observation of 15 T2DM patients in their clinical practice and overall clinical experience. The survey questionnaire consisted of 6 sections with questions on durability of glycaemic control, treatment adherence, patient compliance and time-in-range (TIR).

Results: Most physicians agreed that durability of glycaemic control was an important factor for better clinical outcomes. More than half of the physicians believed that glycaemic control was determined by medication adherence, lifestyle modifications, class of antidiabetic drugs, and duration of diabetes. Along with a weight neutral effect, physicians opined that vildagliptin exhibited reduced risk of hypoglycemia. Stopping medications after feeling better and trouble in swallowing tablets were the two main reasons for medication non-adherence. EAZYGLIDE™ tablet, a fixed-dose combination of vildagliptin plus metformin, was found to improve patient adherence and compliance. In patients with poor TIR, around 76% of physicians recommended dipeptidyl peptidase-4 inhibitor therapy. In all, 87% of physicians prescribed ambulatory glucose profile (AGP) to patients with increased risk of hypoglycemia.

Conclusion: Appropriate evaluation of glycaemic control plays a vital role in the overall management of T2D. EAZYGLIDE™ tablet exhibited improved patient adherence and compliance to therapy owing to its improved features. Patient education about continuous glucose monitoring and AGP and prescription of suitable medications are necessary for enhancing overall clinical outcomes.

Keywords: Type 2 diabetes mellitus, Adherence, Compliance, Time in range, Continuous glucose monitoring

INTRODUCTION

Diabetes mellitus (DM) is a serious, chronic condition and among the top 10 causes of mortality in adults. It accounted for an estimated six million deaths globally in

2021.¹ The estimated prevalence of DM has increased from 285 million in 2009 to 536 million in 2021. Type 2 DM (T2DM) accounts for overwhelming majority of the total cases. The rising trend of T2DM can be attributed to the combined effects of excess body weight, sedentary

behavior, dietary changes, and other factors that have become more prevalent worldwide as the environment has changed.¹ According to study by Anjana and colleagues, an estimated number of people with diabetes based on oral glucose tolerance test criteria in India in 2021 is 101 million.²

A high burden of uncontrolled diabetes exists in India. Results from a study by the IMPACT India initiative indicate that among Indian diabetics, 74% have poor glycemic control (i.e. glycated hemoglobin (HbA1c) $\geq 7\%$; 53 mmol/mol).³ The population-based study TIGHT reported similar levels of glycemic control among patients with T2DM across India.^{3,4}

Treatment algorithms designed to reduce the development or progression of complications of diabetes emphasize the need for good glycemic control.⁵ Long-term durable glycemic control is a difficult goal in the management of T2DM therefore, treatment options should be individualized considering patient characteristics such as degree of hyperglycemia, presence of comorbidities, patient preference, and ability to access treatments; and properties of the treatment such as effectiveness and durability of glucose lowering, risk of hypoglycemia, effectiveness in reducing diabetes complications, effect on body weight, side effects, and contraindications.^{5,6}

Glycemic durability is important to prevent or delay chronic complications and maintain quality of life.⁶ Both the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) study and UK Prospective Diabetes Study (UKPDS) demonstrated metabolic memory or a legacy effect, in which a finite period of intensive control yielded benefits that extended for decades after that control ended.⁷

Early combination therapy using medications with complementary modes of action could achieve optimal glycemic targets and alter disease course more effectively than metformin alone. The VERIFY study showed that early combination treatment with vildagliptin and metformin in patients with early-stage T2DM provides increased glycemic durability with less frequent interventions for treatment intensification over time.⁶ Moreover, after initial combination therapy, there was 26% reduction in risk of time to secondary treatment failure.⁶

Glucose monitoring is another important aspect of diabetes care that can help patients achieve and maintain glycemic targets. Traditional methods of monitoring glucose such as fasting plasma and postprandial plasma glucose or HbA1c do not adequately address hypoglycemia and glycemic variability, and thus have limited utility in achieve glycemic goals.⁸ Continuous glucose monitoring (CGM), which provides information on daily glucose fluctuations and shows the effect of

everyday activities and stress levels on glucose levels, is a useful tool to assess GV.⁸

Guidelines recommend CGM for all patients with diabetes who have hypoglycemia unawareness, and/or frequent hypoglycemia, and patients who have not reached their glycemic target after 3 months of initial antihyperglycemic therapy. Thus, the traditional methods of monitoring glucose may be insufficient to prevent or delay the occurrence of complications. Ambulatory glucose profile (AGP) is a novel, minimally invasive method of assessing glycemic levels on a 24-hour basis, via flash glucose monitoring; it is especially useful in patients with mismatch between HbA1c and fasting/postprandial blood glucose levels, patients at risk/of hypoglycemia and for patient education.^{8,9}

Time in range (TIR) measurements add valuable information when evaluating glycemic control and were found to be correlated with HbA1c levels and diabetic complications in T2DM.⁸ Recent international consensus defined TIR as the time spent in the glucose target range between 70 and 180 mg/dl while reducing time in hypoglycemia for patients using CGM.¹⁰

For optimal management of chronic illnesses, compliance/adherence to therapy are of paramount importance. According to the World Health Organization (WHO), several factors determine patients' ability to follow treatment recommendations correctly.¹¹ The reasons for non-adherence are multifactorial, difficult-to-identify, and include age, information, perception and duration of disease, complexity of dosing regimen, polytherapy, psychological factors, safety, tolerability, and cost.¹²

Difficulty in swallowing tablets remains a major problem in a substantial number of T2DM patients leading to non-compliance to treatment. Patients experience difficulty swallowing large capsules or pills or ones with rough surface coating, which can lead to treatment discontinuation.¹³

Difficulty in pill swallowing can be managed by technological advancements such as special pill coatings. An EAZYGLIDE™ tablet is a special film-coated tablet that provides low adhesion and high slipperiness. The coating of the tablet gives exceptional "slip" to the tablet upon contact with water and thereby allows easy swallowing.¹⁴ Fixed-dose combination tablet of vildagliptin and metformin is an EAZYGLIDE™ tablet.

The new parameters and methods of monitoring changes are an important paradigm shift in the management of T2DM patients. Thus, there was a need to assess glycemic durability with the use of various antidiabetic medications including dipeptidyl peptidase 4 (DDP4) inhibitors, treatment compliance and non-adherence, and use of CGM and TIR in existing care of T2DM patients in India.

METHODS

Study design

A cross-sectional observational questionnaire-based market research study called the Compliance and Durability with antidiabetic Oral medications (COMPANION) survey was conducted across India between November 2020 to June 2021, wherein each physician, with inclusion criteria, having diabetes practice & the experience of managing T2D patients with Eazyglide FDC of Vila+Met was asked to provide responses to each survey question based on their overall clinical experience and observation of 15 patients with T2DM in their clinical practice. Physicians not willing to give consent were excluded.

Sample size

A total of 400 physicians were approached, out of which 367 of them provided consent to participate. Physician confidentiality and anonymity were maintained throughout the conduct of the survey.

Ethical approval

As this survey did not involve any intervention to the patient, ethical approval by an independent ethics review board was not required.

The survey questionnaire consisted of the following 6 sections: 1) Durability/sustainability of glycemic control; 2): DPP4i offering durable glycemic control and other benefits in T2DM management; 3) non-adherence to treatment in real world clinical practice; 4) Patients perspective on EAZYGLIDE FDC (vildagliptin plus metformin) tablet; 5) Physicians perspective on EAZYGLIDE FDC (vildagliptin plus metformin) tablet; and 6) TIR as a monitoring parameter in the management of T2DM. The detailed survey questionnaire is depicted in Table 1.

Statistical analyses

The responses procured were collated, documented, and statistical analyses were carried out using Microsoft Excel. The total percentage of responses for each question was calculated. Pie charts and graphs were formulated to summarize the responses in each section. The outcomes based on the survey responses would facilitate in understanding the perception of physicians and their clinical practices in the management of T2DM in India.

RESULTS

A total of 400 physicians were approached for this survey, out of which 367 of them provided consent to participate and responded to the survey questions. The responses were evaluated and important results were collated sequentially.

Durability/sustainability of glycemic control

All the physicians agreed that durability/sustainability of glycemic control was an important factor for better clinical outcomes in T2DM patients. About 90% of physicians were of the opinion that more than one factor is considered while choosing a medication for patients with T2DM. According to 50% physicians, factors such as quick glycemic control, durable glycemic control, safety profile of drug, and its cardiovascular (CV) benefits are considered while choosing a medication.

According to 67% physicians, the average duration of glycemic control provided by metformin was up to 2 years. Only 7% agreed that average duration is >5 years with metformin. About 65% stated that the average duration of glycemic control with a combination of metformin and DPP4i was 1-5 years. Moreover, 43% physicians believed that the need to intensify a combination of metformin and sulfonylurea with additional antidiabetic drug arose within 1-2 years, whereas 78% physicians stated that the need to intensify therapy with an additional antidiabetic drug arose within 1-5 years.

The average duration of glycemic control with a combination of metformin and sodium- glucose cotransporter 2 (SGLT2) inhibitor was up to 2 and 2-3 years according to 43% and 29% physicians, respectively. Around 92% physicians agreed that more than one factor determined duration of glycemic control. Lastly, more than half of the physicians believed that glycemic control was determined by medication adherence, lifestyle modifications, class of antidiabetic drugs, and duration of diabetes (Figure 1).

Benefits of DPP4i in T2DM management

Around half of the physicians opined that the most common diabetes patient profile for which they would prefer vildagliptin was T2DM with episodes/risk of hypoglycemia, whereas 39% physicians choose vildagliptin for patients with newly diagnosed T2DM.

According to 62% physicians, vildagliptin was associated with an average reduction in HbA1c of 0.6%-1.0%. More than 60% physicians were of the opinion that vildagliptin was not associated with any change in body weight. Along with a weight neutral effect, its significant additional benefit was its tendency for reduced risk of hypoglycemia. Approximately 47% of physicians preferred vildagliptin due to its low hypoglycemic effect.

Non-adherence to treatment

In all, 47% physicians stated that 10%-20% of their patients were non-adherent to treatment. Approximately 76% of the physicians opined that up to 20% of patients are non-adherent to treatment. Stopping medications after feeling better and trouble in swallowing the tablets were

the two main reasons for medication non-adherence. More than half of the physicians confirmed that the main reason for treatment non-adherence was patient tendency to stop medicines once they felt better.

About 25% of patients faced a problem with swallowing tablets as stated by 87% of physicians. The size and shape of tablets were important factors causing trouble in swallowing as stated by 46% physicians. In all, 26% physicians stated that patients often complain of tablets getting stuck in their throat/mouth. About 60% physicians suggested that there was more than one complaint regarding trouble in swallowing tablets. Tablets getting stuck in the mouth/throat was the primary complaint of patients (Figure 2). Another observation was that patients occasionally asked their physicians to switch medication when they experienced difficulty in swallowing tablets.

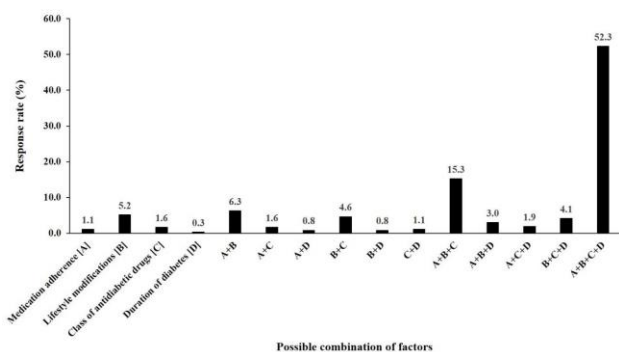


Figure 1: Factors affecting duration of glycemic control.

Patients' perspective on EAZYGLIDE™ FDC tablet

Table 2 provides the overall summary of patients' perspective on EAZYGLIDE™ vildagliptin plus metformin FDC tablet. Physicians were of the opinion that the EAZYGLIDE™ FDC tablet was easy to swallow

and glided easily with less amount of water. In all, 33% physicians strongly agreed and 63% agreed that patients required less amount of water to swallow EAZYGLIDE™ tablets. Moreover, 25% physicians strongly agreed and 74% agreed that patients were satisfied with the texture of EAZYGLIDE™ tablets, whereas 21% physicians strongly agreed and 75% agreed that they had a pleasant odor. Patients did not experience aftertaste with the tablet (Table 2). It was found that 98% patients had a clear preference for this tablet. Overall, EAZYGLIDE™ FDC tablets were found to improve patient adherence and compliance.

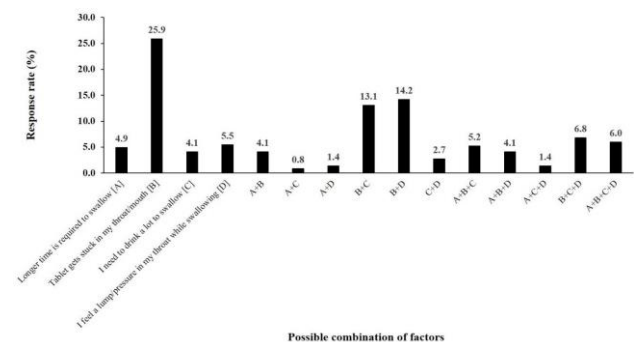


Figure 2: Patient responses on trouble in swallowing tablets.

Physicians' perspective on EAZYGLIDE™ FDC

In all, 38% physicians strongly agreed and 62% agreed that patients had an overall good acceptability for the tablet (Table 3). The EAZYGLIDE™ technology was found to resolve the problem of difficulty in swallowing. These tablets exhibited improved patient adherence and compliance to therapy as agreed upon by 65% physicians. Physicians also agreed that this technology should be applied to other large-sized medications.

Table 1: COMPANION survey questionnaire.

Questions	Responses			
Section 1: Durability/sustainability of glycemic control				
Q1. Do you consider durability/sustainability of glycemic control as an important factor for better clinical outcome in your T2DM patients?	a)	Yes	b)	No
Q2. What are the drug-related factors that you consider while choosing a medication for your T2DM patients? (one or more options can be selected)	a)	Quick glycemic control offered by drug		b) Durable glycemic control offered by drug
	c)	Safety profile of drug		d) Cardiovascular benefits
Q3. What is the average duration of glycemic control that you have seen with metformin in your T2DM patients?	a)	<1 year	b) 1-2 years	c) 2-5 years d) >5 years
Q4. What is the average duration of glycemic control that you have seen with metformin +	a)	<1 year	b) 1-2 years	c) 2-5 years d) >5 years

Continued.

Questions	Responses			
DPP4i in your T2DM patients?				
Q5. In patients on metformin + sulfonylurea regimen, when does the need arise to intensify therapy with additional antidiabetic drug?	a) <1 year	b) 1-2 years	c) 2-5 years	d) >5 years
Q6. What is the average duration of glycemic control that you have seen with metformin + SGLT2i in your T2DM patients?	a) <1 year	b) 1-2 years	c) 2-3 years	d) 3-5 years
Q7. What are the factors that determine duration of glycemic control in your T2DM patients? (one or more options can be selected)	a) Medication adherence		b) Lifestyle modifications	
	c) Class of antidiabetic drugs		d) Duration of diabetes	
Section 2: DPP4i offering durable glycemic control and other benefits in T2DM management				
Q1. What is the most common diabetes patient profile for which you choose vildagliptin as a preferred antidiabetic agent?	a) T2DM with episodes/risk of hypoglycemia		b) Newly diagnosed T2DM	
	c) Overweight or obese T2DM patients		d) Patients with severe renal impairment	
Q2. What is the average reduction in HbA1c caused by vildagliptin in your patients?	a) <0.5%	b) 0.6%-1.0%	c) 1.1%-1.5%	d) >1.5%
Q3. What is the weight change caused by vildagliptin in your patients?	a) No change in weight		b) Weight reduction of <1 kg	
	c) Weight reduction of 1-2 kg		d) Weight gain	
Q4. Apart from glycemic control, what is the most important benefit because of which you prefer DPP4i for your diabetic patients?	a) Proven cardiovascular safety		b) Reduction in hypoglycemic episodes	
	c) Weight neutrality		d) Incretin effect	
Section 3: Nonadherence to treatment in real world clinical practice				
Q1. What percentage of your diabetic patients are non-adherent to treatment?	a) <10%	b) 10- 20%	c) 21-30%	d) >30%
Q2. Main reason for non-adherence among your patients is?	a) Forget to take medications		b) Have trouble swallowing tablets	
	c) Stop taking medications once they feel better		d) Side effects of medications	
Q3. What percentage of patients in your clinical practice have trouble in swallowing of tablets?	a) <10%	b) 10%-25%	c) 26%-40%	d) >40%
Q4. In your clinical practice, patients have trouble swallowing tablets mainly due to following reason:	a) Size and shape of tablet	b) Texture of tablet	c) Taste of tablet	d) Shape of tablet
	a) Longer time is required to swallow		b) Tablet gets stuck in my throat/mouth	
Q5. In your opinion, patients often express difficulty in swallowing with following complaint:	c) I need to drink a lot to swallow		d) I feel a lump/pressure in my throat while swallowing	
Q6. Due to difficulty in swallowing, how frequently patients ask you to switch medications?	a) Very frequently	b) Frequently	c) Occasionally	d) Rarely
Section 4: Patients perspective on EAZYGLIDE™ FDC (vildagliptin plus metformin) tablet				
Q1. Patients feel that the amount of water needed to swallow this tablet is less.	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q2. Patients feel satisfied with the texture of this tablet	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q3. As per patient's viewpoint - this tablet glides easily as compared to other tablets	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree

Continued.

Questions	Responses			
Q4. According to the patients, this tablet has pleasant odor	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q5. Patients find it easy to swallow this tablet	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q6. Patients feel there is no aftertaste with this tablet	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q7. Patients have clear preference for this tablet	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Section 5: Physicians perspective on EAZYGLIDE™ FDC (vildagliptin plus metformin) tablet				
Q1. This tablet has overall good acceptability among your patients	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q2. This tablet will help resolve the problem of difficulty in swallowing	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q3. Compliance and adherence will improve among the patients with this tablet	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
Q4. This technology should be applied in other larger sized medications as well	a) Strongly agree	b) Agree	c) Disagree	d) Strongly disagree
SECTION 6: Time-in-range (TIR) as a monitoring parameter in the management of T2DM				
Q1. In your clinical practice, what percentage of patients have mismatch between HbA1c and fasting/postprandial blood sugar levels (HbA1c on target but FBS/PPBS not on target OR FBS/PPBS on target but HbA1c not on target)?	a) 0%-10%	b) 10%-25%	c) 25%-50%	d) >50%
Q2. What is the most common factor that limits use of CGM device/ambulatory glucose profile (AGP) in your clinical practice?	a) Patient unwillingness	b) Cost of the device	c) Difficulty in understanding AGPreport	d) Cumbersome process
Q3. Do you consider recommending DPP4i therapy for patients with poor TIR?	a) Yes	b) Occasionally	c) No	d) Not sure
Q4. In what percentage of patients do you prescribe AGP because they are at increased risk of hypoglycemia?	a) 0%-10%	b) 10%-25%	c) 25%-50%	d) >50%
Q5. Which other class of antidiabetic drugs have improved TIR in your T2DM patients?	a) SGLT2 inhibitors	b) TZDs (pioglitazone)	c) GLP-1 RA	d) Alpha glucosidase inhibitor

CGM, continuous glucose monitoring; DPP4i, dipeptidyl peptidase 4 inhibitor; FBS, fasting blood sugar; FDC, fixed-dose combination; GLP-1 RA, glucagon-like peptide 1 receptor agonist; HbA1c, glycated hemoglobin; PPBS, postprandial blood sugar; SGLT2, sodium glucose cotransporter 2; T2DM, type 2 diabetes mellitus; TIR, time in range; TZDs, thiazolidinediones.

Table 2: Overall summary of patients' perspective on EAZYGLIDE™ fixed-dose combination tablet.

Parameter (%)	Strongly agree	Agree	Disagree	Strongly disagree
Amount of water needed to swallow the tablet is less	33.0	63.0	4.0	0.0
Texture of the tablet is satisfactory	25.0	74.0	1.0	0.0
The tablet glides easily as compared to other tablets	32.0	66.0	2.0	0.0
The tablet has pleasant odor	21.0	75.0	4.0	0.0
The tablet is easy to swallow	30.0	69.0	1.0	0.0
The tablet has no aftertaste	23.0	74.0	3.0	0.0
Clear preference for the tablet	28.0	70.0	2.0	0.0

Table 3: Overall summary of physicians' perspective on EAZYGLIDE™ fixed-dose combination tablet.

Parameter (%)	Strongly agree	Agree	Disagree	Strongly disagree
The tablet has overall good acceptability among patients	38.0	62.0	0.0	0.0
The tablet will help resolve the problem of difficulty in swallowing	34.0	64.0	0.0	0.0
Compliance and adherence will improve among the patients with the tablet	34.0	65.0	1.0	0.0
EAZYGLIDE™ technology should be applied in other larger sized medications as well	41.0	57.0	2.0	0.0

TIR: A monitoring parameter in the management of T2DM

Approximately 82% of the physicians agreed that patients showed a mismatch between HbA1c and fasting/postprandial blood sugar levels. Device cost and patient unwillingness were key factors limiting the use of CGM in clinical practice. In patients with poor TIR, around 76% of physicians recommended DPP4i therapy. The other class of drugs that was found to improve TIR was SGLT2 inhibitors, as opined by 79% of physicians. Moreover, 87% of the physicians prescribed AGP to patients with increased risk of hypoglycemia.

DISCUSSION

The current survey was conducted with a purpose of highlighting important aspects with respect to medication adherence, patient compliance and methods of monitoring changes in the management of T2DM patients in India. The survey helped in understanding the clinical perception of physicians regarding drug-related factors considered while choosing a medication, significance of durability of glycemic control, improving patient adherence, TIR as a monitoring parameter and overall benefits of EAZYGLIDE™ FDC tablets. It is well recognized that the total burden of diabetes can be decreased by achieving glycemic control in majority of patients.¹⁵ An understanding of the relationship between hyperglycemia, glycemic variability, risk, and appropriate combination of antidiabetic agents effectively and safely to minimize complications is imperative. Efforts towards glycemic control must involve routine monitoring of daily blood glucose values, and combination therapy that targets both fasting and postprandial hyperglycemia.¹⁵

Diabetes management has moved on from “one size fits all” care to an individualized approach for each patient which encompasses numerous factors that influence a physician's choice of a particular agent. These include efficacy, cost, side effects, patient preference for maximizing adherence, durability of efficacy, and additional benefits.¹⁶ Medication durability is a key factor

when selecting the most appropriate agent that will have sustained efficacy for a patient. Once a patient is at goal, a durable medication will keep them at goal and need less visits/titrations/interventions.¹⁶ The current survey confirmed that in routine clinical practice, durability of glycemic control was a key factor responsible for better clinical outcomes in T2DM patients.

Majority of the physicians acknowledged that factors like medication adherence, lifestyle modifications, class of antidiabetic drugs, and duration of diabetes influenced glycemic control. DPP4 inhibitors aid in diabetes management at all stages of the disease, and are suitable for combination with other agents to promote daily glycemic control.¹⁵ According to clinical evidence, vildagliptin efficiently reduces HbA1c, has low risk of hypoglycemia, and is weight neutral.¹⁷

As established by the VERIFY trial, vildagliptin-metformin combination in patients with early-stage T2DM increased glycemic durability of target HbA1c levels with less frequent interventions for treatment intensification over time.⁶ The vildagliptin-metformin combination also reduces gastrointestinal adverse events substantially and is well tolerated with a low incidence of adverse events. Moreover, it does not increase the risk of cardiovascular/cerebrovascular events, can be taken before or after meals, and has little drug interactions.¹⁷ In the current survey, most of the physicians agreed that vildagliptin could be a preferred choice in patients with risk of hypoglycemia and newly diagnosed T2DM. More than half the physicians believed that vildagliptin shows a weight-neutral effect.

Adherence to treatment is a key component of chronic disease management.¹¹ Even with numerous therapies available for T2DM, studies have depicted that <50% of patients achieve the glycemic goals recommended by the American diabetes association.¹² Poor medication adherence is one of the major contributing factors for inadequate glycemic control in T2DM patients.¹⁸

It is linked to important nonpatient factors such as lack of integrated care in many healthcare systems and clinical inertia among healthcare professionals, patient demographic factors like young age, low education level, and low income level; critical patient beliefs about their medications; and other factors like treatment complexity, out-of-pocket costs, and hypoglycemia.¹⁸ The National Health and Wellness Survey conducted by DiBonaventura et al, which enrolled 1,198 T2DM patients reported that each 1-point drop in self-reported medication adherence was linked with 0.21% increase in HbA1c, as well as 4.6%, 20.4%, and 20.9% increase in physician, emergency room, and hospital visits, respectively.¹⁹

Size and shape of tablets also have an effect on patient adherence.²⁰ These factors affect transit of the drug through the pharynx and esophagus and may directly affect the ability to swallow the drug. Difficulty in swallowing tablets could be a problem for many individuals and eventually result in many adverse events and patient noncompliance with therapy regimens.²⁰

Furthermore, studies assessing the effect of tablet size on ease of swallowing suggest that increases in size are linked with increases in patient complaints related to swallowing.²⁰ Specific barriers to medication adherence in T2DM need to be clearly identified and strategies targeting them necessitate behavioral innovations along with new methods/modes of drug delivery.¹⁸

Consistent with this evidence, physicians in our survey agreed that trouble in swallowing tablets was responsible for medication non-adherence, whereas size and shape of tablets were important factors causing trouble in swallowing. In the current survey, responses from physicians and patients suggested that EAZYGLIDE™ FDC tablets overcame numerous barriers related to medication non-adherence. They exhibited improved patient adherence and compliance to therapy, attributable to its unique features like ease of swallowability, ease of gliding with less amount of water, satisfactory texture, and pleasant odor.

CGM enables convenient and comprehensive assessment of blood glucose levels, including hyperglycemia/hypoglycemia and glycemic variability.²¹ The use of an AGP report effectively consolidates and displays CGM data, allowing clinicians to rapidly evaluate overall glycemia and identify patterns of concern, thereby facilitating more informed therapy decision-making, and helps patients better manage their disease by understanding interactions between their medications, meals, and exercise.⁸

Despite the stated benefits, progress with CGM has been gradual, largely due to issues of cost, reliability, difficulties in use, and lack of a standardized format for data display.²¹ Two patient surveys conducted by Engler et al. confirmed that cost and accuracy considerations

were substantial barriers for adoption and adherence to current CGM systems even among technology-savvy individuals.²² On similar lines, physicians of our survey stated that device cost and patient unwillingness were major limiting factors with regards to its use in clinical practice.

In recent years, TIR has been considered vital metric for evaluating glycemic control, and comparing different glucose-lowering interventions.⁸ In our survey, majority of the physicians recommended DPP4i therapy in cases of poor TIR and prescribed AGP to most of the patients due to increased risk of hypoglycemia. In accordance with the survey findings, patient education concerning CGM, AGP, and treatment modification based on AGP reports are imperative.

Because the survey involved physicians from various zones in the country, the results may be generalizable to the Indian setting. However, the current study has few limitations. The relationship between patients and their physicians that could have affected level of medication adherence was not evaluated in this study. Moreover, the number of respondents was low. Larger studies are needed to address knowledge gaps among physicians with regards to optimizing medication use in accordance with patient profiles and appropriate implementation of CGM in routine settings.

CONCLUSION

Appropriate management of diabetes is imperative for minimizing complications and improving quality of life. Therefore, appropriate evaluation of glycemic control, good drug adherence, and patient compliance are essential. EAZYGLIDE™ FDC tablets have the potential to improve patient adherence and compliance owing to their unique features of good swallowability, gliding properties, satisfactory texture, and pleasant odor. Patient education about CGM and AGP and subsequent treatment modification are necessary for enhancing overall clinical outcomes.

ACKNOWLEDGMENT

We would like to thank Scientimed Solutions Pvt. Ltd. for assisting in manuscript development.

Funding: The research survey was funded by Abbott Healthcare Pvt. Ltd.

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for

2045. Diabetes research and clinical practice. 2022;183:109119.
2. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, Das AK, et al. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *The Lancet Diabetes & Endocrinol*. 2023;11(7):474-89.
3. Das AK, Mohan V, Joshi S, Shah S, Zargar AH, Kalra S, Unnikrishnan AG, Kumar A, Mithal A, Tandon N. IMPACT India: a novel approach for optimum diabetes care. *J Diabetol*. 2021;12(3):239-45.
4. Borgharkar SS, Das SS. Real-world evidence of glycemic control among patients with type 2 diabetes mellitus in India: the TIGHT study. *BMJ Open Diabetes Res Care*. 2019;7:654.
5. Davies MJ, Aroda VR, Collins BS, Gabbay RA, Green J, Maruthur NM, et al. Management of hyperglycemia in type 2 diabetes, 2022. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes care*. 2022;45(11):2753-86.
6. Matthews D, Del Prato S, Mohan V, Mathieu C, Vencio S, Chan JC, et al. Insights from VERIFY: Early combination therapy provides better glycaemic durability than a stepwise approach in newly diagnosed type 2 diabetes. *Diabetes Ther*. 2020;11:2465-76.
7. El Sayed NA, Aleppo G, Aroda VR, Bannuru RR, Brown FM, Bruemmer D, et al. Glycemic targets: standards of care in diabetes—2023. *Diabetes Care*. 2023;46(1):97-110.
8. Unnikrishnan AG, Saboo B, Joshi S, Kesavadev J, Makkar BM, Agarwal S, et al. Consensus statement on use of ambulatory glucose profile in patients with type 2 diabetes mellitus receiving oral antidiabetic drugs. *J Assoc Physicians India*. 2019;67:76-83.
9. Kalra S, Gupta Y. Ambulatory glucose profile: Flash glucose monitoring. *J Pak Med Assoc*. 2015;65:1360-2.
10. Gabbay MA, Rodacki M, Calliari LE, Vianna AG, Krakauer M, Pinto MS, et al. Time in range: a new parameter to evaluate blood glucose control in patients with diabetes. *Diabetol Metab Syndr*. 2020;12:1-8.
11. Fernandez-Lazaro CI, García-González JM, Adams DP, Fernandez-Lazaro D, Mielgo-Ayuso J, Caballero-Garcia A, et al. Adherence to treatment and related factors among patients with chronic conditions in primary care: a cross-sectional study. *BMC Fam Pract*. 2019;20:132.
12. Garcia-Perez LE, Álvarez M, Dilla T, Gil-Guillén V, Orozco-Beltrán D. Adherence to therapies in patients with type 2 diabetes. *Diabetes Ther*. 2013;4:175-94.
13. Christofides EA. Practical insights into improving adherence to metformin therapy in patients with type 2 diabetes. *Clin Diabetes*. 2019;37:234-41.
14. Hofmanová JK, Rajabi-Siahboomi A, Haque S, Mason J, Teckoe J, To D, et al. Developing methodology to evaluate the oral sensory features of pharmaceutical tablet coatings. *Int J of Pharm*. 2019;562:212-7.
15. Bode BW. Defining the importance of daily glycemic control and implications for type 2 diabetes management. *Postgrad Med*. 2009;121:82-93.
16. Schroeder EB. Management of type 2 diabetes: selecting amongst available pharmacological agents. *Endotext*. 2022. Available at: <https://pubmed.ncbi.nlm.nih.gov/39888888/>. Accessed on 17 August 2024.
17. Pan C, Wang X. Profile of vildagliptin in type 2 diabetes: efficacy, safety, and patient acceptability. *Ther Clin Risk Manag* 2013;9:247-57.
18. Polonsky WH, Henry RR. Poor medication adherence in type 2 diabetes: recognizing the scope of the problem and its key contributors. *Patient Prefer Adherenc*. 2016;10:1299-307.
19. DiBonaventura M, Wintfeld N, Huang J, Goren A. The association between nonadherence and glycated hemoglobin among type 2 diabetes patients using basal insulin analogs. *Patient Prefer Adherence*. 2014;8:873-82.
20. 1. Center for Drug Evaluation and Research. Size, shape, and other physical attributes of generic tablets and caps. Available at: <https://www.fda.gov/regulatory>. Accessed on 12 August 2024.
21. Ajjan R, Slattery D, Wright E. Continuous glucose monitoring: A brief review for primary care practitioners. *Adv Ther*. 2019;36:579-96.
22. Engler R, Routh TL, Lucisano JY. Adoption barriers for continuous glucose monitoring and their potential reduction with a fully implanted system: Results from patient preference surveys. *Clin Diabetes* 2018;36:50-8.

Cite this article as: Kalra S, Deshmukh V, Joshi A, Agarwal S, Baruah MP, Sahay R. Glycaemic durability and compliance among type 2 diabetes mellitus patients from India: results from the companion survey. *Int J Community Med Public Health* 2024;11:4742-50.