National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Efficacy of teneligliptin with metformin in Type 2 diabetes mellitus patients

Batta Raghuveer, Nama Netaji

Department of Pharmacology, Gandhi Medical College, Secunderabad, Telangana, India

Correspondence to: Batta Raghuveer, E-mail: drraghuveer2019@gmail.com

Received: March 07, 2020; **Accepted:** May 13, 2020

ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is rapidly growing epidemic in India. It is well known that the level of glycemia is associated with complications of T2DM. **Aims and Objectives:** The objective of this study was to assess the efficacy of teneligliptin with metformin in T2DM patients. **Materials and Methods:** This was a randomized, open-label, comparative study carried out for the duration of 1 year in Gandhi Medical College, Secunderabad, Telangana. One hundred patients inadequately controlled on metformin 1 g alone; having glycated hemoglobin (HbA1c) >6.5, fasting blood sugar (FBS) >110 mg/dl, and postprandial blood sugar (PPBS) >180 mg/dl attending the outpatient Department of General Medicine, Kamineni Institute of Medical Sciences. All patients were randomly allotted into two groups. Fifty patients were started with teneligliptin along with metformin. Fifty patients were started with placebo while continuing with metformin. The endpoint was change in fasting plasma glucose (FPG), postprandial blood glucose (PPBH), and HbA1c levels at 24 weeks as compared to the baseline levels in both groups. The efficacy was assessed by measuring the change in the FPG, PPBH, and HbA1c levels after 24 weeks of treatment. Data were presented in the form of statistical tables and charts. SPSS software version 20 was used for statistical analysis. **Results:** After 24 weeks of treatment with teneligliptin and metformin, case subjects had significant decrease in FBS, PPBS, and HbA1c. There was no significant change in BMI, blood pressure, and lipid parameters in both groups after study. All patients tolerated drugs well without any side effects. **Conclusions:** The combination of teneligliptin with metformin was associated with clinically significant reduction in HbA1C. This study depicted that teneligliptin can be an effective alternative to other drugs for add on therapy to the patients who are inadequately controlled with metformin alone.

KEY WORDS: Teneligliptin; Metformin; Diabetes Mellitus; Type 2; Serum Glutamic Pyruvic Transaminase; Glycated Hemoglobin; Fasting Blood Sugar; Postprandial Blood Sugar

INTRODUCTION

Diabetes mellitus/diabetes is a chronic lifelong condition that affects our body's ability to use energy found in food. Diabetes occurs in two situations when the pancreas produces little or no insulin/the pancreas makes insulin, but the insulin does not work as it should, this condition is called insulin resistance. There are three types of diabetes: Type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), and gestational diabetes. The causes of diabetes mellitus are not known, but there are few risk factors that increase the chance of getting diabetes: Family history, being overweight, physical stress (such as injury or illness), age, and smoking.[1,2]

Access this article online	
Website: www.njppp.com	Quick Response code
DOI:10.5455/njppp.2020.10.03058202013052020	

Metformin belongs to a class of drugs called biguanides used alone or with other medications including insulin to treat T2DM. Metformin works by decreasing hepatic glucose production by inhibiting gluconeogenesis and

glycogenolysis. It delays intestinal absorption of glucose and enhances insulin sensitivity by increasing peripheral glucose uptake and utilization. Dipeptidyl peptidase-4 inhibitor also referred to as DPP4 or gliptins are a class of hypoglycemics that block the enzyme DPP4. It can be used to treat T2DM.

Teneligliptin is an oral DPP4 inhibitor used in management of T2DM.[3] It works by increasing the release of insulin from pancreas and decreasing the hormones that raise blood sugar levels. It is cheaper and more effective, well tolerated and has its profile similar to other DPP4 inhibitors. It can be safely administered in patients with mild, moderate, or severe renal impairment or end-stage renal disease without adjusting dose and also used in patients with mild-to-moderate hepatic impairment.[4] Teneligliptin in combination with metformin has been systematically evaluated in T2DM as monotherapy in many short- and long-term studies which have reported a reduction in glycated hemoglobin (HbA1c) of 0.8–0.9% within 12 weeks of therapy[5] and in long-term sustained improvement in glycemic control. Patients on teneligliptin-metformin exhibited better control over glycemic as well as lipid profile.

MATERIALS AND METHODS

Place of Study

This study was conducted at Gandhi Medical College, Secunderabad, Telangana.

Type of Study

This was a randomized, open-label, comparative study.

Sample Collection

Sample size: 100.

Sampling Methods

This was a consecutive sampling method.

Inclusion Criteria

Patients inadequately controlled on metformin 1 g alone, having HbA1c >6.5, fasting blood sugar (FBS) >110 mg/dl, and postprandial blood sugar (PPBS) >180 mg/dl.

Exclusion Criteria

Acute illness, pregnancy, macrovascular diabetes complication, liver disease, and thyroid disorder were excluded from the study.

Statistical Methods

Data were presented in the form of statistical tables and charts. SPSS software version 20 was used for statistical analysis.

Ethical Approval

Approval was taken from the Institutional Ethics Committee before commencement of the study.

Drug: Teneligliptin 20 mg+ Metformin ≥1000 mg.

Dosage: Teneligliptin (20 mg once daily) for 24 weeks in combination with metformin.

RESULTS

Out of 100 patients suffering from T2DM, males were predominant with 64% when compared to females 36%. The most people with type 2 DM belonged to the age group of 51–60 years and majority around 63% of the patients had T2DM for the duration of 0–5 years, Table 1.

The mean weight reduced to 1.9 kg, mean BMI reduced to 5.81, mean cholesterol reduced to 20.83, mean serum creatinine, and SGPT hardly showed any difference with 0 and 0.07, respectively, Table 2.

The glycemic efficacy was assessed by analyzing the mean change in the value of FBS, PPBS, and HbA1c from the start of the therapy to the end of 24 weeks study period. The mean FBS, PPBS, and HbA1C showed significant improvement when treated with teneligliptin and metformin. The mean FBS reduced by 45.3, PPBS reduced by 78.46, and HbA1C reduced by 1.67 during the 24 weeks course of treatment, Table 3.

DISCUSSION

The study was designed to study the efficacy of teneligliptin with metformin. The prevalence of T2DM was higher in males with 64% than females with 36%. According to the previous research carried out by Bennett *et al*.[6] and Howteerakul *et al*.,[7] the prevalence of T2DM among men was higher than among women which is similar to our study. T2DM is

Table 1: Distribution of patients with regard to gender, age, and duration of type 2 diabetes mellitus

Variables	Frequency	Percentage
Male	64	64
Female	36	36
Age group		
21–30	12	12
31–40	21	21
41–50	29	29
51–60	38	38
Duration (in years)		
0–5	63	63
6–10	37	37

Table 2: Comparison of various factors such as weight, BMI, cholesterol, **triglycerides**, serum **creatinine**, and **serum glutamic** pyruvic transaminase both before and after treatment

Variables	Before treatment	After treatment	Mean reduction	*P*-value
	Mean±SD	Mean±SD		
Weight (kg)	76.133±8.05	74.233±8.42	1.9	0.1045
BMI	30.986±3.88	25.170±2.88	5.78	<0.001
Cholesterol	171.91±43.75	151.06±41.50	20.83	0.0007
Triglycerides	228.15±74.47	205.46±72.90	22.69	0.0306
HDL	38.90±1.33	42.30±1.34	-3.4	0.002
LDL	110.85±5.97	93.27±5.918	17.58	0.005
VLDL	38.30±2.30	34.21±1.94	4.09	0.02
Serum creatinine	0.83±0.33	0.83±0.33	0	1.000
Serum glutamic pyruvic transaminase	33.85±3.72	33.92±3.50	0.07	0.8911

Table 3: Comparison of FBS, PPBS, and HbA1c before and after treatment with teneligliptin and metformin in 24 weeks

Teneligliptin + metformin	Before treatment	After treatment	Mean reduction	*P*-value
	Mean±SD	Mean±SD		
FBS	168.92±24.55	123.62±10.12	45.3	<0.0001
PPBS	243.56±37.62	165.10±35.15	78.46	<0.0001
HbA1C	8.77±0.90	7.1±0.51	1.67	<0.0001

FBS: Fasting blood sugar, PPBS: Postprandial blood sugar, HbA1C: Glycated hemoglobin, SD: Standard deviation

commonly seen in middle-aged individuals, especially after 50 years of age. The mean age in this study was 51–60 years, this fact is supported by the study conducted by Kishimoto *et al*.[8] This study showed a positive family history of 40% of patients, one or both parents had T2DM, transferred from one generation to another at one point in their life. This also was in line with Bennett *et al*.'s wider prospective study. In this study, the average DM period was 0–5 years, consistent with the preceding study by Jeon *et al*.[9] where the average time was 5.89 years.

The glycemic efficacy was assessed by analyzing the mean change in the value of FBS and postprandial blood; patients showed an improvement in their glycemic parameters such as FBS, PPBS, and HbA1c during the study period.

At the end of 24 weeks of teneligliptin and metformin combination therapy, the following results were noted. The mean HbA1C, FBS, and PPBS were significantly ($P \leq 0.0001$) reduced to 7.1 ± 0.5% 123.62 ± 9.31mg/dL and 165.10 ± 35.15 mg/dL, respectively. The results of this study are perfectly consistent with the sugar (PPBS) and HbA1C from the start of the therapy of teneligliptin and metformin to the end of 24 weeks study period. The results pointed out that all the previous study conducted by Kim *et al*.[10] tested in combination with teneligliptin and metformin in recognized type II diabetic Korean patients whose glycemic status was not managed with metformin monotherapy, this shows that teneligliptin adds to metformin therapy shows a significant reduction in glycemic parameter. Another study conducted by in Ghosh *et al*. (TREAT-INDIA),[11] there was statistically significant improvement in mean HbA1c, fasting plasma glucose (FPG), and PPG with teneligliptin therapy. Mean changes in HbA1c, FPG, and PPG were 1.37 ± 1.15%, 51.29 ± 35.41 mg/dL, and 80.89 ± 54.27 mg/dL, respectively.

Teneligliptin with metformin was effective and well tolerated in patients with type II diabetes and has a long half-life of 26.9 h with a special pharmacokinetic benefit that makes for easy once-daily administration irrespective of diet. It has dual mode of elimination through renal and hepatic; hence, it can be administered safely in renal impairment patients. No dose modification is needed for mild-to-moderate hepatic impairment. Appropriate approach to diabetes care would include not only glycemic control but also early protection of the role of the islet cells and avoiding the progression of the disease.

CONCLUSIONS

The study demonstrated the effectiveness of teneligliptin with metformin which significantly improves glycemic parameters in T2DM patients over a period of time and it also very cost effective than the others.

REFERENCES

1. Piero MN, Nzaro GM, Njagi JM. Diabetes mellitus-a devastating metabolic disorder. Asian J Biomed Pharm Sci 2014;4:1-7.
2. Kadowaki T, Kondo K. Efficacy, safety and dose-response

relationship of teneligliptin, a dipeptidyl peptidase-4 inhibitor, in Japanese patients with Type 2 diabetes mellitus. Diabetes Obes Metab 2013;15:810-8.
3. Abubaker M, Mishra P, Swami OC. Teneligliptin in management of diabetic kidney disease: A review of place in therapy. J Clin Diagn Res 2017;11:OE05-9.
4. Goda M, Kadowaki T. Teneligliptin for the treatment of Type 2 diabetes. Drugs Today (Barc) 2013;49:615-29.
5. Shah K. Teneligliptin in early diabetic kidney disease: An observation in Asian Indian patients with Type 2 diabetes mellitus in real-life scenario. J Clin Diagn Res 2017;11:OC22-5.
6. Bennett WL, Wilson LM, Bolen S, Maruthur N, Singh S, Chatterjee R, *et al*. Oral Diabetes Medications for Adults with Type 2 Diabetes: An Update. Rockville, MD: Agency for Healthcare Research and Quality; 2011.
7. Howteerakul N, Suwannapong N, Rittichu C,Rawdaree P. Adherence to regimens and glycemic control of patients with Type 2 diabetes attending a tertiary hospital clinic. Asia Pac J Public Health 2007;19:43-9.
8. Kishimoto M. Teneligliptin: A DPP-4 inhibitor for the treatment of Type 2 diabetes. Diabetes Metab Syndr Obes 2013;6:187-95.
9. Jeon HJ, Karasik AT, Liu J, Wu M, Meininger G. Efficacy and safety of the dipeptidyl peptidase-4 inhibitor sitagliptin added to ongoing metformin therapy in patients with Type 2 diabetes inadequately controlled with metformin alone. Diabetes Care 2011;29:2638-4.
10. Kim SA, Shim WH, Lee EH, Lee YM, Beom SH, Kim ES, *et al*. Predictive clinical parameters for the therapeutic efficacy of sitagliptin in Korean Type 2 diabetes mellitus. Diabetes Metab J 2011;35:159-65.
11. Ghosh S, Trivedi S, Sanyal D, Modi KD, Kharb S. Teneligliptin real-world efficacy assessment of Type 2 diabetes mellitus patients in India (TREAT-INDIA study). Diabetes Metab Syndr Obes 2016;9:347-53.

How to cite this article: Raghuveer B, Netaji N. Efficacy of teneligliptin with metformin in Type 2 diabetes mellitus patients. Natl J Physiol Pharm Pharmacol 2020;10(08):663-666.

Source of Support: Nil, **Conflicts of Interest:** None declared.