



## **A COMPARISON OF THE EFFICACY OF GLIMEPIRIDE PLUS METFORMIN VERSUS TENELIGLIPTIN PLUS METFORMIN THERAPY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS**

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### **Abstract:**

**Background and aim:** Defects in insulin secretion and action are metabolic diseases termed diabetes mellitus. This research aimed to compare the efficacy of glimepiride plus metformin versus teneligliptin plus metformin therapy in patients with type 2 diabetes mellitus.

**Method:** A prospective observational study was conducted on 48 patients suffering from type 2 diabetes mellitus in the outpatient department. The participants were divided into two groups (each group consists of 24 participants). The first group received glimepiride plus metformin, and the second group received teneligliptin plus metformin. The patient's FBS and PPBS levels were monitored for consecutive months.

**Results:** A total of 24 patients with type 2 diabetes mellitus participated in this study in each group. Comparing the FBS levels of both groups, more reduction was found in the teneligliptin plus metformin therapy, and a significant reduction of the PPBS level was also found in the teneligliptin plus metformin therapy than in the glimepiride plus metformin therapy.

**Conclusion:** The findings of this research indicate that teneligliptin plus metformin therapy was effective and had better efficacy than glimepiride plus metformin in reducing the glycaemic parameter in patients with type 2 diabetes mellitus.

**Key words:** Type 2 diabetes mellitus, Tenzeligliptin, Glimepiride, Metformin, Efficacy

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### **Introduction:**

Defects in insulin secretion and action are metabolic diseases termed diabetes mellitus. Diabetes is of different types: Type 1, mostly Type 2, and rarely gestational diabetes mellitus<sup>[1]</sup>. The American Diabetes Association guidelines put forth metformin as the first line therapy for baseline HbA1c. If HbA1c is >7.5% dual therapy can be initiated by adding any other specific drug to the metformin<sup>[2]</sup>. For such conditions second line drugs usually sulfonylurea and dipeptidyl peptidase 4 inhibitors category of drugs are mostly used with metformin.

In sulfonylurea category, there are Multiple doses of glimepiride and metformin are accessible and commonly recommended in India for efficient blood glucose management due to its capability of counteracting "insulin secretion disorder" and "insulin resistance,"<sup>[3]</sup>. However, glimepiride causes an increase in the body's endogenous production of insulin, which may result in hypoglycemia. Glimepiride also causes weight gain, which is another serious adverse effect that might interfere with the management of diabetes since weight reduction is often a primary focus of diabetes therapy<sup>[4]</sup>.

According to the recommendations published by the Research Society for the Study of Diabetes in India (RSSDI), the combination of DPP4Is and metformin is more successful in lowering HbA1C (one percent) than metformin treatment alone<sup>[2]</sup>. Although several research investigations have shown that gliptins, such as sitagliptin, vildagliptin, and saxagliptin, lower the amount of glucose in the blood<sup>[5]</sup>.

Whereas teneligliptin is a class 3 dipeptidyl peptidase-4 inhibitor (DPP4I) with a structural feature that increases its potency and selectivity, making it five times more active than other gliptins and resulting in wider inhibition of DPP-4<sup>[6]</sup>. In individuals with type 2 diabetes mellitus, glycemic control is significantly improved by adding teneligliptin to metformin treatment compared to those on metformin-glimepiride therapy<sup>[7]</sup>. As a result, this research aimed to compare the efficacy of glimepiride plus metformin versus teneligliptin plus metformin therapy in patients with type 2 diabetes mellitus.

### **Methodology:**

A prospective observational study was conducted on 48 patients suffering from type 2 diabetes mellitus in the outpatient department of the JIP hospital, Chennai. Each participant was given a full

explanation of every part of this research, and we got their informed consent before including them in this study. Before the study, the patient's FBS, PPBS and HbA1c levels of each participant was recorded. Then the participants was divided into two groups (each group consists of 24 participants). The first group received glimepiride plus metformin, and the second group received teneligliptin plus metformin. The patient's FBS and PPBS levels were monitored for consecutive months, and the patient's HbA1c levels was observed every three months during the study. Then, statistical analysis was used to compare the efficacy of glimepiride plus metformin therapy and teneligliptin plus metformin therapy in patients with type 2 diabetes mellitus.

### **Study instruments:**

The tools used to analyse for this study includes patient data collection form which consist of patient name, contact details, age, sex, (FBS, PPBS, HbA1c & body weight) values. The main blood sugar parameters used in this study are Fasting Blood Sugar level, Post Prandial Blood Sugar level & HbA1c level.

### **Patient selection:**

#### **Inclusion Criteria:**

Type 2 diabetes mellitus patients who are all taking glimepiride plus metformin or teneligliptin plus metformin were aged above 18 years and those patients who are willing to participate in this study are included in the study.

#### **Exclusion Criteria:**

Patients who are not diagnosed with diabetes, Type 2 diabetes mellitus patients who are taking other antihyperglycemic drugs other than glimepiride plus metformin or teneligliptin plus metformin, gestational diabetic patients, patients aged less than 18 years and those patients who are not willing to participate in this study are excluded from the study.

#### **Statistical analysis:**

The data was entered into Microsoft Excel and SPSS software version 27, where the t test and p value were carried out to determine the mean of the samples, the standard error mean and the significance. The parameters mainly analysed statistically are FBS, PPBS and HbA1c levels.

### **Results:**

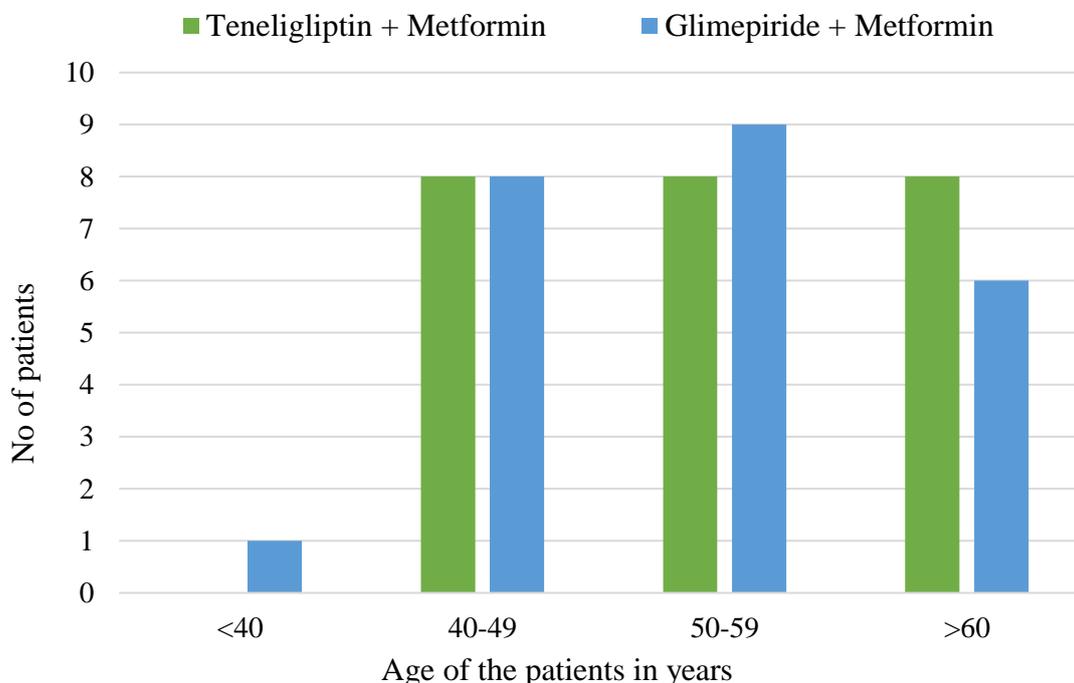
A total of 24 patients with type 2 diabetes mellitus participated in each group of teneligliptin +

metformin and glimepiride + metformin therapy in this study.

**Table 1:** Demographic characteristics of the patients

DEMOGRAPHIC CHARACTERISTICS		TYPE OF THERAPY		TOTAL
		Metformin + Tenzeligiptin	Metformin + Glimepiride	
Age	<40	0(0%)	1(4.1%)	1(2%)
	40-49	8(33.3%)	8(33.3%)	16(33.4%)
	50-59	8(33.3%)	9(37.5%)	17(35.4%)
	>60	8(33.3%)	6(4%)	14(29.2%)
	<b>Mean</b>	<b>56.17</b>	<b>52.75</b>	
Sex	Male	9(37.5%)	11(45.8%)	20(41.7%)
	Female	15(62.5%)	13(54.2%)	28(58.3%)
	<b>Total</b>	<b>24</b>	<b>24</b>	<b>48</b>
Comorbidities	Present	12(50%)	11(45.8%)	23(47.9%)
	Absent	12(50%)	13(54.2%)	25(52.1%)
	<b>Total</b>	<b>24</b>	<b>24</b>	<b>48</b>
Type of Comorbidities	Hypertension	9	7	19
	Cholesterol	1	2	3
	Hypothyroidism	2	2	4

Table 1 displays the demographic characteristics of the patients which includes age, sex, comorbidities and the type of comorbidities.



**Figure 1:** Patients demographics by age group

Figure 1 displays the patients demographics by age group. In tenzeligiptin + metformin therapy, there were 0 (0%) patient in <40 years of age, 8 (33.3%) patients in 40–49 years of age, 8 (33.3%) patients in 50–59 years of age, and 8 (33.3%) patients in

>60 years of age and the mean age was 56.17. In glimepiride + metformin therapy, there were 1 (4.1%) patient in <40 years of age, 8 (33.3%) patients in 40–49 years of age, 9 (37.5%) patients

in 50–59 years of age, and 6 (4%) patients in >60 years of age and the mean age was 52.75.

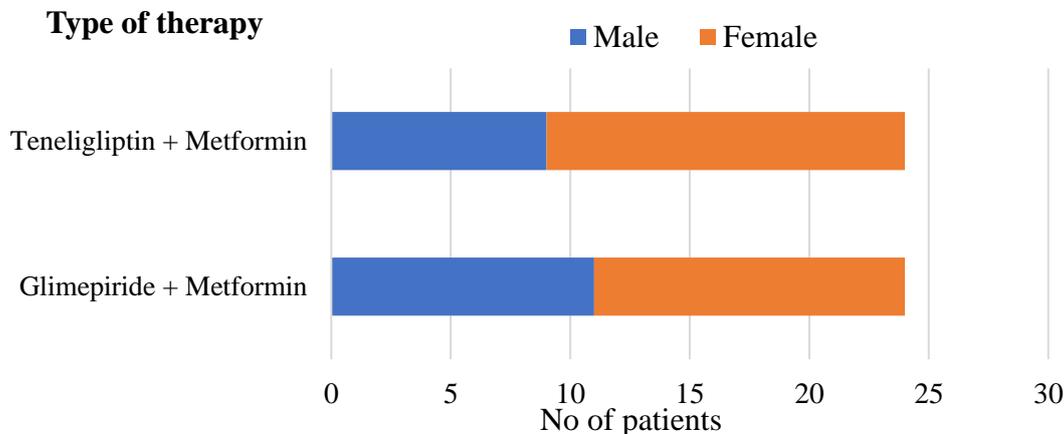


Figure 2: Patients demographics by sex

Figure 2 displays the patients demographics by sex. In tenzeligiptin + metformin therapy, there were 9(37.5%) male patients and 15(62.5%) female patients. In glimepiride + metformin

therapy, there were 11(45.8%) male patients and 13(54.2%) female patients.

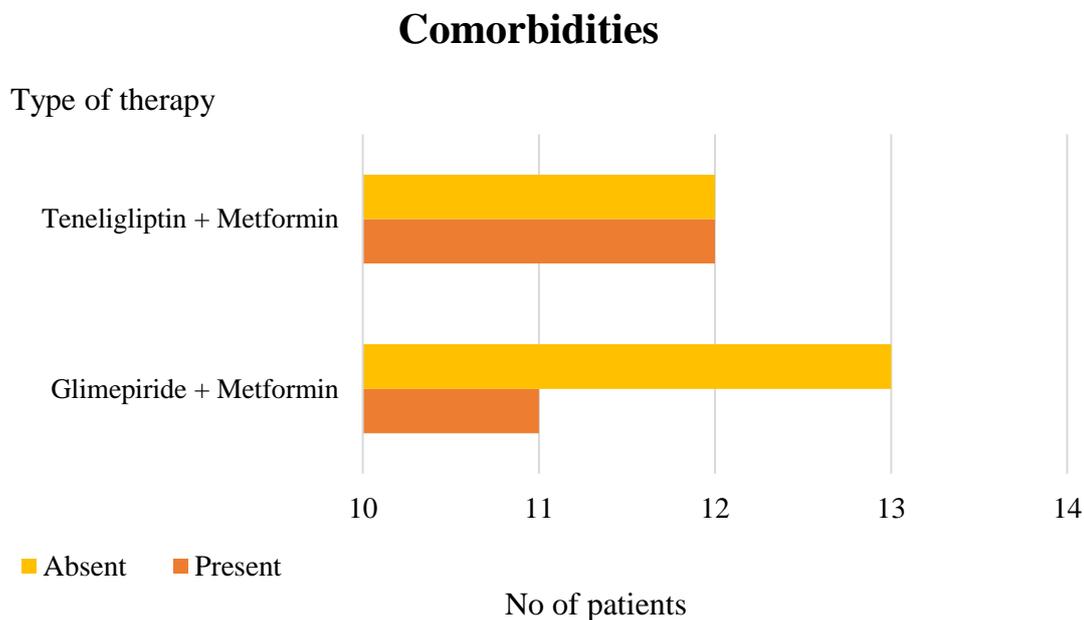
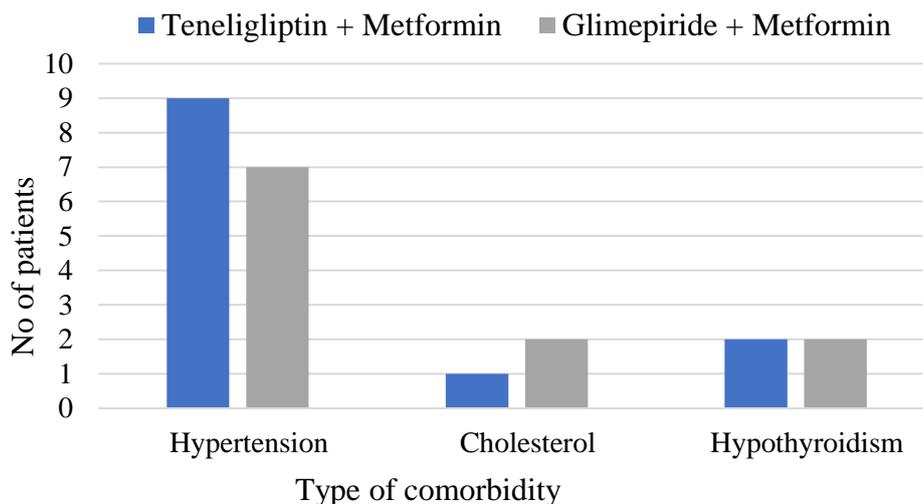


Figure 3: Patients demographics by comorbidities

Figure 3 displays the patient's demographics by comorbidities. In tenzeligiptin + metformin therapy, 12(50%) patients are present with comorbidity, and 12(50%) patients are without

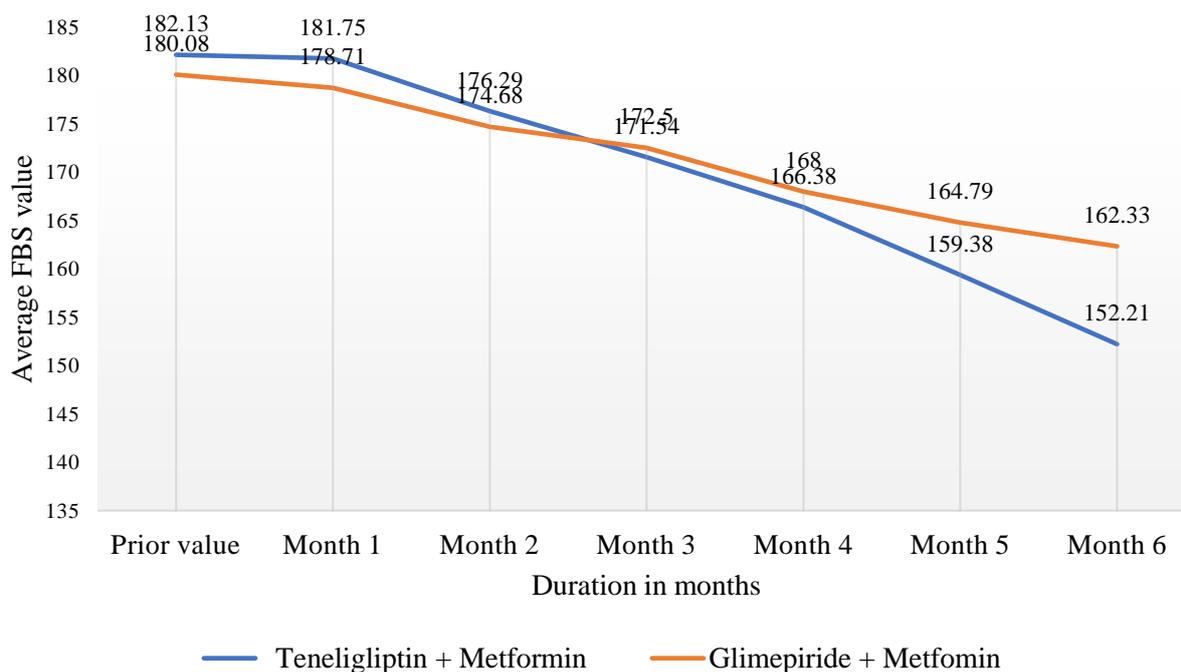
comorbidity. In glimepiride + metformin therapy, 11(45.8%) patients presented with comorbidity, and 13(54.2%) patients were without comorbidity.



**Figure 4:** Patient demographics by type of comorbidity

Figure 4 displays the patient's demographics by type of comorbidity. In tenziglipitin + metformin therapy, 9 patients have hypertension, 1 patient has cholesterol and 2 patients have hypothyroidism. In

glimepiride + metformin therapy, 7 patients have hypertension, 2 have cholesterol and 2 have hypothyroidism.



**Figure 5:** FBS levels of the patients

Figure 5 displays the FBS levels of the patients taken before starting the study (prior value) and during the study period.

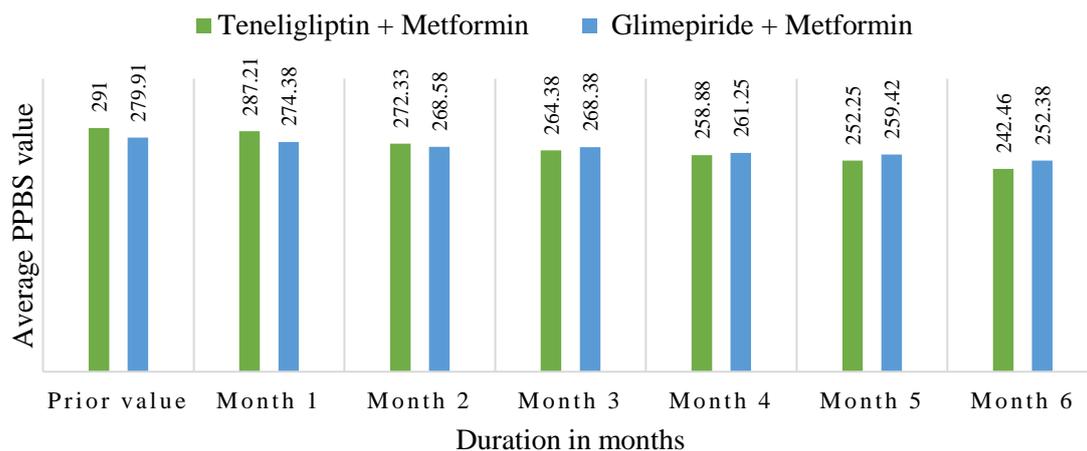


Figure 6: PPBS levels of the patients

Figure 6 displays the PPBS levels of the patients taken before starting the study (prior value) and during the study period.

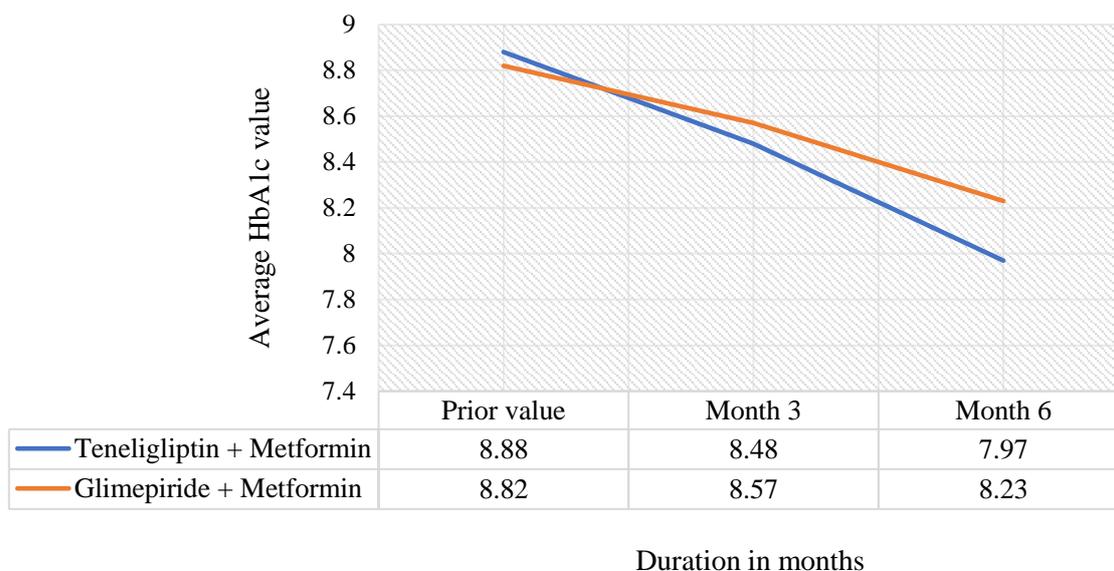


Figure 7: HbA1c levels of the patients

Figure 7 displays the HbA1c levels of the patients taken before starting the study (prior value) and during the study period.

Table 2: Comparison of difference in glycemic parameters of teneligliptin + metformin and glimepiride + metformin before the therapy

Parameters	Type of therapy	Mean ± Std. Error Mean	p value
FBS	Tenzeligliptin + metformin	182.13 ± 9.07	.893
	Glimepiride + metformin	180.08 ± 12.01	
PPBS	Tenzeligliptin + metformin	291.00 ± 11.03	.560
	Glimepiride + metformin	279.91 ± 15.35	
HbA1C	Tenzeligliptin + metformin	8.88 ± 0.19	.891
	Glimepiride + metformin	8.82 ± 0.34	

P<0.05 - Significant, P<0.01 – More significant, P<0.001 – Highly significant

Table 2 displays the comparison of the difference in glycemia parameters between the patient groups

before starting teneligliptin + metformin and glimepiride + metformin therapy.

**Table 3:** Comparison of difference in glycemia parameters of teneligliptin + metformin and glimepiride + metformin after therapy

Parameters	Type of therapy	Mean ± Std. Error Mean	p value
FBS	Teneligliptin + metformin	152.21 ± 6.27	.220
	Glimepiride + metformin	162.33 ± 5.19	
PPBS	Teneligliptin + metformin	229.46 ± 8.86	.503
	Glimepiride + metformin	236.38 ± 11.72	
HbA1C	Teneligliptin + metformin	7.97 ± 0.18	.468
	Glimepiride + metformin	8.23 ± 0.31	

P<0.05 - Significant, P<0.01 – More significant, P<0.001 – Highly significant

Table 3 displays the comparison of the difference in glycemia parameters between the patient

groups after the completion of teneligliptin + metformin and glimepiride + metformin therapy.

**Table 4:** Comparison of changes in glycemia parameter of teneligliptin + metformin therapy

Parameters	Before Therapy	After therapy	p value
	Mean ± SEM	Mean ± SEM	
FBS	182.13 ± 9.07	152.21 ± 6.27	0.000
PPBS	291.00 ± 11.03	229.46 ± 8.86	0.001
HbA1C	8.88 ± 0.19	7.97 ± 0.18	0.002

P<0.05 - Significant, P<0.01 – More significant, P<0.001 – Highly significant

Table 4 displays the comparison of changes in the glycemia parameter taken before and after the teneligliptin + metformin therapy. In teneligliptin + metformin therapy the FBS level taken before the therapy was 182.13 ± 9.07, and after the therapy was 152.21 ± 6.27 with p value 0.000. The PPBS

level taken before the therapy was 291.00 ± 11.03, and after the therapy was 229.46 ± 8.86 with p value 0.001. The HbA1C level taken before the therapy was 8.88 ± 0.19, and after the therapy was 7.97 ± 0.18 with p value 0.002.

**Table 5:** Comparison of changes in glycemia parameter of glimepiride + metformin therapy

Parameters	Before Therapy	After therapy	p value
	Mean ± SEM	Mean ± SEM	
FBS	180.08 ± 12.01	162.33 ± 5.19	0.000
PPBS	279.91 ± 15.35	236.38 ± 11.72	0.002
HbA1C	8.82 ± 0.34	8.23 ± 0.31	0.002

P<0.05 - Significant, P<0.01 – More significant, P<0.001 – Highly significant

Table 5 displays the comparison of changes in the glycemia parameter taken before and after the glimepiride + metformin therapy. In glimepiride + metformin therapy the FBS level taken before the therapy was 180.08 ± 12.01, and after the therapy was 162.33 ± 5.19 with p value 0.000. The PPBS level taken before the therapy was 279.91 ± 15.35, and after the therapy was 236.38 ± 11.72 with p value 0.002. The HbA1C level taken before the therapy was 8.82 ± 0.34, and after the therapy was 8.23 ± 0.31 with p value 0.002.

In this research, 40–60 years age group diabetes patients evenly participated in teneligliptin + metformin therapy and 50–59 years age group diabetes patients highly participated in glimepiride + metformin therapy. Female diabetes patients predominantly participated in both the groups of teneligliptin + metformin and glimepiride + metformin therapy. In teneligliptin + metformin therapy there was more number of diabetes patients with comorbidity, whereas in glimepiride + metformin therapy there was more number of diabetes patients without comorbidity. In both the treatment therapy patients predominantly had hypertension as the comorbidity.

**Discussion:**

This research compared the efficacy of teneligliptin + metformin and glimepiride + metformin in patients with type 2 diabetes mellitus.

The glycemia parameters used to compare the efficacy between teneligliptin + metformin and glimepiride + metformin therapy are FBS, PPBS and HbA1c levels were taken from the patients before starting the study and every consecutive month during the study period. While comparing the difference in the glycemia parameters of both the groups which was taken before starting the therapy, the FBS level of teneligliptin + metformin therapy was  $182.13 \pm 9.07$  and glimepiride + metformin therapy was  $180.08 \pm 12.01$  with the p value of .893, their no significant difference between both the groups in the FBS level and the p value was not significant. The PPBS level of teneligliptin + metformin therapy was  $291.00 \pm 11.03$  and glimepiride + metformin therapy was  $279.91 \pm 15.35$  with the p value of .560, there was only a slight difference between both the groups in the PPBS level and the p value was not significant. The HbA1c level of teneligliptin + metformin therapy was  $8.88 \pm 0.19$  and glimepiride + metformin therapy was  $8.82 \pm 0.34$  with the p value of .891, there was only a point difference between both the groups in the HbA1c level and the p value was not significant.

While comparing the difference in the glycemia parameters of both the groups which was taken after completion of the therapy, the FBS level of teneligliptin + metformin therapy was  $152.21 \pm 6.27$  and glimepiride + metformin therapy was  $162.33 \pm 5.19$  with the p value of .220, there was a reduction in both the groups in the FBS level and the p value was not significant. The PPBS level of teneligliptin + metformin therapy was  $229.46 \pm 8.86$  and glimepiride + metformin therapy was  $236.38 \pm 11.72$  with the p value of .503, there is a significant reduction in both the groups in the PPBS level and the p value was not significant. The HbA1c level of teneligliptin + metformin therapy was  $7.97 \pm 0.18$  and glimepiride + metformin therapy was  $8.23 \pm 0.31$  with the p value of .468, there was a slight reduction in both the groups in the HbA1c level and the p value was not significant.

While comparing both the groups FBS level taken before and after the completion of the therapy. In teneligliptin + metformin therapy before starting the therapy it was  $182.13 \pm 9.07$  and after the therapy it was  $152.21 \pm 6.27$ , with p value of 0.000. The p value was highly significant. Whereas in the glimepiride + metformin therapy before starting the therapy it was  $180.08 \pm 12.01$  and after the therapy it was  $162.33 \pm 5.19$ , with p value of 0.000. The p value was highly significant. Comparing the

FBS level of both groups more reduction was found in the teneligliptin + metformin therapy. While comparing both the groups PPBS level taken before and after the completion of the therapy. In teneligliptin + metformin therapy before starting the therapy it was  $291.00 \pm 11.03$  and after the therapy it was  $229.46 \pm 8.86$ , with p value of 0.001. The p value was highly significant. Whereas in the glimepiride + metformin therapy before starting the therapy it was  $279.91 \pm 15.35$  and after the therapy it was  $236.38 \pm 11.72$ , with p value of 0.002. The p value was more significant. Comparing the PPBS level of both groups more significant reduction was found in the teneligliptin + metformin therapy.

While comparing both the groups HbA1c level taken before and after the completion of the therapy. In teneligliptin + metformin therapy before starting the therapy it was  $8.88 \pm 0.19$  and after the therapy it was  $7.97 \pm 0.18$ , with p value of 0.002. The p value was more significant. Whereas in the glimepiride + metformin therapy before starting the therapy it was  $8.82 \pm 0.34$  and after the therapy it was  $8.23 \pm 0.31$ , with p value of 0.002. The p value was more significant. Comparing the HbA1c level of both groups better reduction was found in the teneligliptin + metformin therapy.

Agarwal P et al. have reported that, though a decrease in FPG was seen in the group that was given teneligliptin, the difference was not statistically significant when compared to the group that was given placebo. The PPG levels showed a larger improvement in the group that was given teneligliptin as opposed to the group that was given a placebo<sup>[5]</sup>.

In the Nishanth T. et al. study, they reported significant reductions in HbA1c and PPBS levels<sup>[8]</sup>. Whereas in the study conducted by Hans N, it was reported that the reduction of FBS and HbA1c levels with teneligliptin + metformin was greater than that with glimepiride + metformin<sup>[9]</sup>. Tenzeligliptin has been shown to efficiently regulate glycemia indices in patients of all ages, according to the Ghosh S. et al. study<sup>[6]</sup>.

### **Conclusion:**

This prospective study was centred on the efficacy of glimepiride plus metformin and teneligliptin plus metformin when compared to both therapies in type 2 diabetes mellitus patients. The findings of this research indicate that teneligliptin plus metformin therapy was effective and had better efficacy than glimepiride plus metformin in

reducing the glycemia parameter in patients with type 2 diabetes mellitus. In the future, genomic studies can be conducted to identify the exact action of teneligliptin plus metformin and glimepiride plus metformin therapy.

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