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Original Article

A COMPARATIVE STUDY OF EFFICACY ON GLYCEMIC CONTROL BY GLIMEPIRIDE VERSUS TENELIGLIPTIN AS AN ADD ON TO METFORMIN THERAPY IN TYPE 2 DIABETES MELLITUS PATIENTS

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ABSTRACT

Objective: In our study, the objective was to evaluate the effectiveness of glycemic control of Glimepiride versus Teneligliptin for 2nd-line therapy in combination with Metformin in T2DM patients.

Methods: A Randomized, Observational, Prospective study has been conducted in outpatient and inpatient departments of General Medicine in RVM Hospital (Laxmakkapally, Mulugu, Siddipet, Telangana). A total of 100 patients with T2DM were recruited in our study in which 50 patients were in Group A (Metformin-Glimepiride) and the other 50 patients were in Group B (Metformin-Teneligliptin). The comparative assessment of efficacy was conducted using glycemic parameters such as FBS, PPBG and HbA1c to interpret the results.

Results: The mean difference values of HbA1c pre-treatment and post-treatment of Group A were calculated as 1.47 and of Group B was 0.83. The mean difference values FBS pre-treatment and post-treatment of Group A were found to be 56.96 and Group B was 29.62. The PLBS mean difference at Pre-treatment and Post-treatment of Group A and Group B was obtained to be 115.8 and 52.58, respectively.

Conclusion: From the results obtained, we hereby conclude that, though there was no large difference between the lowering of HbA1c values by two Groups, the FBS and PLBS levels were diminished significantly by Group A (Metformin-Glimepiride) than Group B (Metformin Teneligliptin). Therefore, Glimepiride is considered to be more beneficial than Teneligliptin when combined with Metformin Monotherapy.

Keywords: Metformin, Glimepiride, Teneligliptin, FBS, PLBS, HbA1c

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INTRODUCTION

Diabetes is a continual metabolic ailment characterized by way of the presence of hyperglycemia because of defective insulin secretion, faulty insulin action, or both. Diabetes is often classified into the subsequent general categories:

1. Type 1 Diabetes Mellitus

2. Type 2 Diabetes Mellitus

3. Gestational DM

4. Specific diabetic forms due to various causes, e. g.

- Monogenic diabetes syndromes
- Exocrine pancreas diseases (cystic fibrosis and pancreatitis)
- Diabetes induced by drugs (use of glucocorticoids, HIV/AIDS treatment, etc.)

Type 2 Diabetes Mellitus is a progressive heterogeneous disorder characterized with various degrees of resistance of insulin and pancreatic β-cell dysfunction due to interaction between several environmental and genetic factors, resulting in increased glucagon production, hyperglycemia and probably reduced PLBS GLP-1 secretion. Concurrent alterations in β-cell function include a duration of compensatory hyperinsulinemia with an irregular secretory structure. The deterioration in β-cell function tends to cause persistent hyperglycemia (glucotoxicity), chronic non-esterified exposure to fatty acids (lipotoxicity), oxidative stress, inflammation and amyloid formation.

The various risk factors include overweight, unhealthy diet, physical inactivity, increasing age, high BP, ethnicity, defective glucose tolerance and history of diabetes in their family [1]. Management includes lifestyle interventions, medications, regular monitoring for complications and laboratory assessment. The goal of treatment is to achieve normal sugar levels in the blood without extremely increased or decreased sugar level and prevention of microvascular and macrovascular complications [2-7].

Table 1: Medications

No	Characteristics	Metformin	Glimepiride	Teneligliptin
1	DRUG CLASS	Biguanide	Sulphonyl urea	DPP-4inhibitor
2	DOSE	500-1000 mg	1 mg,2 mg.4 mg	20 mg,40 mg
3	ADR	• Anorexia/Weight loss • Impaired Vitamin B12	• GI disturbances • Headache • Mild skin reactions • Photosensitivity • Mild alcohol intolerance • Hypoglycemia	• Hypoglycemia • Intestinal Obstruction • Liver dysfunction • Interstitial pneumonia

The ADA recommends Metformin for the initial pharmacological analogue. However, maximum sufferers will require a combination pharmacological remedy to attain healing goals, whilst metformin monotherapy is inadequate to reach or hold goal desires as the second-line remedy.

Sulfonylurea is a common 2nd-line remedy due to its speedy onset of glucose-reducing effect. DPP-4 inhibitors show a glycemic-reducing impact than SU. Besides, DPP-4 inhibitor is more costly than SU. This observation helped the physicians in providing the patient targeted method. SU is the older drug regarded for decades, the whole magnificence of medication cannot be considered homogenous that's presently observed in the case of Glimepiride, SU which has precise characteristics consisting of affiliation of decrease low sugar levels and weight neutral impact. Our goal turned to find the efficiency of antidiabetic tablets–Glimepiride and Teneligliptin for 2nd-line therapy further to stable doses of Metformin [8-14].

Aim

A comparative study of efficacy on Glycemic control by Glimepiride versus Teneligliptin as an add on to Metformin therapy in T2DM patients.

Objectives

In our study, we evaluated the glycemic control of Glimepiride versus Teneligliptin for 2nd-line therapy combined with Metformin in T2DM patients and to assess the glycemic triad reports of the subjects.

MATERIALS AND METHODS

The study is a randomized, prospective, observational study at RVM Institute of Medical Sciences and Research Centre, Laxmakkapally, Siddipet. The duration of the study was for 6 mo after approval by The Institutional Human Ethical Committee of GCPK (GCPK/IEC/JUNE2019-20/B03). A total of 100 samples were taken for the study and divided into 2 groups. Group A–50 samples [Metformin 500 mg–Glimepiride 1 mg] and Group B-50 samples [Metformin 500 mg-Teneligliptin 20 mg].

Study criteria

Inclusion criteria

- T2DM
- Age above 18 y
- Denovo DM
- Patients with comorbid conditions and complications
- FBG, PLBS,HbA1c values available
- Patients interested to participate in the study

Exclusion criteria

- T1DM
- Patients on insulin therapy
- Pregnant, Paediatrics, mentally disabled and emergency cases
- Patients whose lab data was not available
- Surgical condition
- A patient using other hypoglycaemic agents

A suitable data collection form (Annexure 1, 2) was designed to collect, document and analyze the data. The informed consent section was incorporated in Telugu and English languages (Annexure 3, 4). The data collection form included the provision for the collection of information related to demographic details of patients (name, age, sex, contact details, address) diagnosis, medication usages before hospital admission and during the patient stay, past medical history. A patient information leaflet (Annexure-5a and 5b) was provided to the patients, which contained information regarding Diabetes and its Types, Diagnosis, Exercise and Diabetic diet plan.

All patients were reviewed in the IP and OP departments. Those patients who meet the study criteria were enrolled. The patient history was collected. DM and other comorbid conditions were documented and analysed.

Descriptive statistics and Graphical presentation of FBS, PLBS, HbA1c values are expressed as Frequency, Percentage, Mean and SD. Comparisons were made between the drugs by using paired and unpaired t-test and Correlation coefficient calculated between Pre-treatment and Post-treatment parameters. In all analyses, $P<0.05$ was significant. Using SPSS statistical software, Version 22 all statistical analyses were performed.

RESULTS

A total of 100 patients were recruited in the study who met the eligibility criteria from both Outpatient and Inpatient Departments.

The mean age of the population in our study was 50.84±9.573 (fig. 1).

More number of males were recruited compared to females (54% vs 46%) (fig. 2)

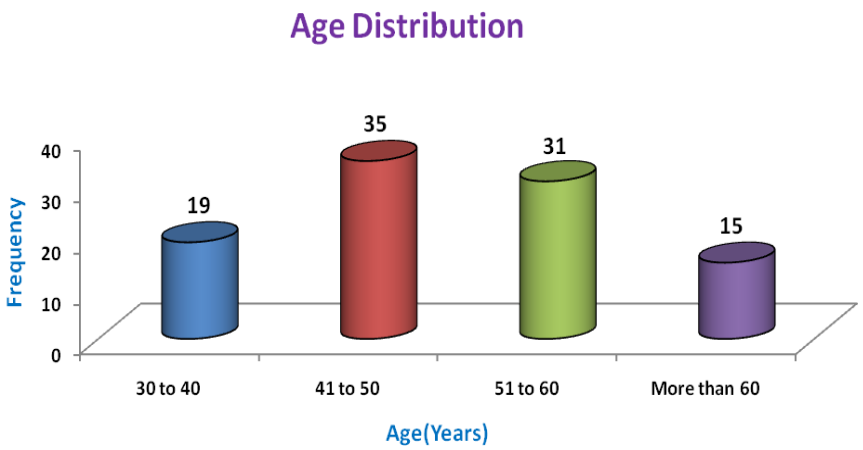

Fig. 1: Age distribution

The pre-treatment value of Group A was 169.78±30.14 and Group B was 158.28±14.86 with t-value and P-value (2.42, 0.017*), respectively. The pre-treatment value of Group A was 287.64±61.26and Group B was 245.44±26.55 with t-value and P-value (4.47, 0.0000*), respectively. Before treatment (Pre-Treatment) of Group A was 8.06±1.33 and of Group B was 7.30±0.97 with t-value and P-value (3.26, 0.0000*) respectively (fig. 3).

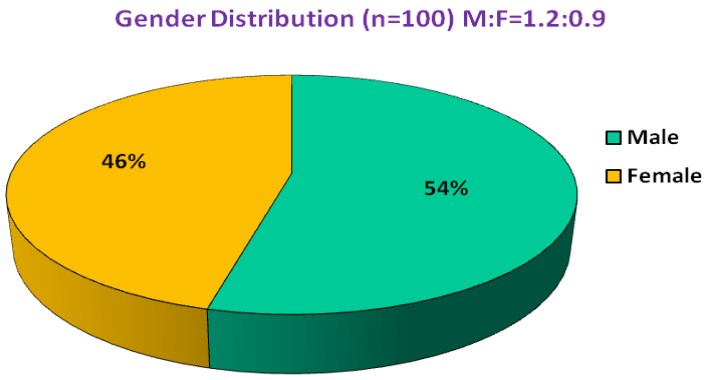

Fig. 2: Gender distribution

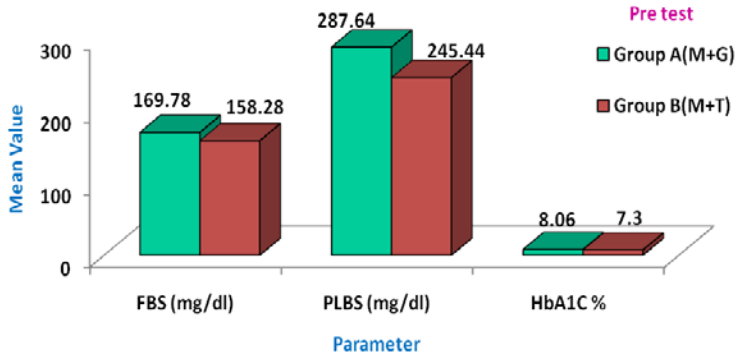

Fig. 3: Lab parameters in pre-test study group

The post-treatment value of Group A was 112.82±30.14 and Group B was 128.66±10.22 with t-value and P-value (5.401, 0.0000*), respectively. The post-treatment value of Group A was 171.84±26.16and Group B was 192.86±16.06 with t-value and P-value (4.842, 0.0000*), respectively. After treatment (Post-treatment) of Group A was 6.59±0.56, Group B was 6.47±0.55 with t-value and P-value (1.027, 0.307) respectively (fig. 4).

The comparison of Pre-treatment and Post-treatment values of Group A were 169.78±30.14 and 112.82±30.14 with t-value and P-value (13.16, 0.0000*) respectively and the mean difference was calculated to be 56.96. I The Individual PPBG values of Group A Pre-treatment and Post-treatment was 287.64±61.26and171.84±26.16 with t-value and P-value (15.38, 0.0000*) respectively and the mean difference was calculated to be 115.8. Individual Group A Pre-treatment and Post-treatment HbA1c values were 8.06±1.33 and 6.59±0.56 with t-value and P-value (11.44, 0.0000*) and the mean difference was calculated to be 1.47(fig. 5).

The comparison of Pre-treatment and Post-treatment FBS values of Group B were 158.28±14.86 and 128.66±10.22 with t-value and P-value (20.41, 0.0000*) respectively and the mean difference was calculated to be 29.62. The Individual PPBG values of Group B Pre-treatment and Post-treatment were found to be 245.44±26.55and192.86±16.06 with t-value and P-value (17.15, 0.0000*) respectively and the mean was calculated to be 52.58. Individual Group B Pre-treatment and Post-treatment HbA1c values were 7.30±0.97and6.47±0.55with t-value and P-value (10.60, 0.0000*) and the mean difference was calculated to be 0.83(fig. 6).

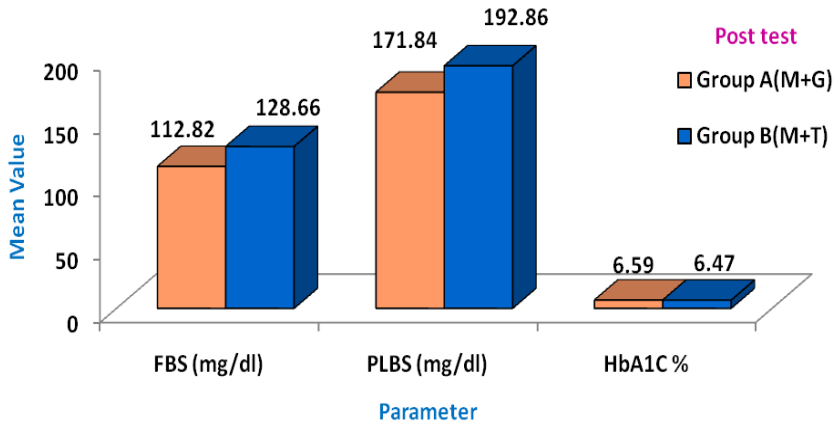

Fig. 4: Comparison of lab parameters in the post-test study group, values are interpreted as mean±SD, *Values are statistically significant by Paired two-sample t-test; P<0.05

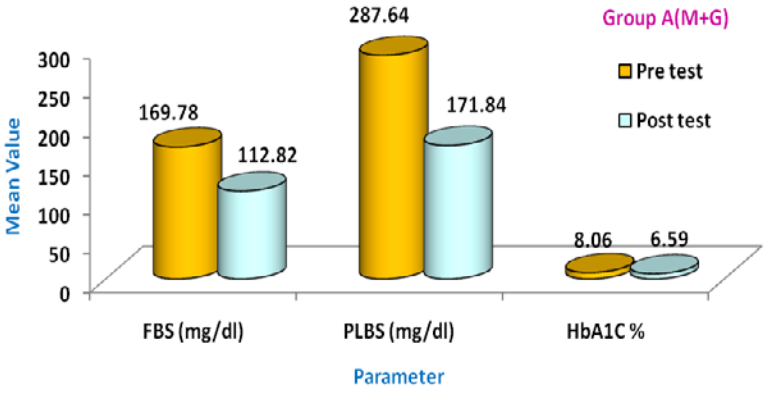

Fig. 5: Comparison of glycemic parameters of the group a

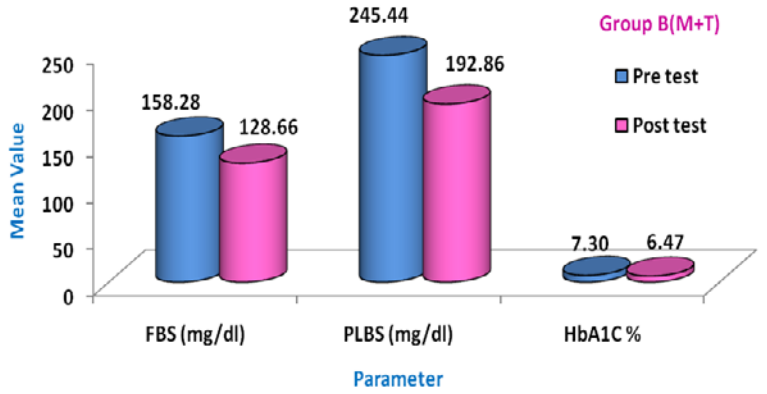

Fig. 6: Comparison of glycemic parameters of group b

Table 2: Comparison of mean

	Group A	Group B
Reduction in FBS	56.96	29.62
Reduction in PLBS	115.8	52.58
Reduction in HbA1c	1.47	0.83

DISCUSSION

According to ADA 2021 [American Diabetic Association] metformin is the first line of drug for diabetic patients and if glycemic control not achieved, can add sulphonylurea or DPP4 inhibitor as add on therapy.

Among 100 patients taken in the study, 54% were males and 46% were females, indicating a high prevalence in males according to our study. The mean age of the subjects recruited in the study was 50.84. The maximum percentage of age group enrolled were of 41-50 y group[35%], later comes 51-60 y group[31%]followed by 30-40 y group and more than 60 y group with 19% and 15% respectively. In our present study results are similar with the study conducted by Devarajan *et al.* [15] and T Nishanth *et al.* [16].

Group A pre-treatment and Post-treatment HbA1c values were 8.06±1.33 and 6.59±0.56 with t-value and P-value (11.44, 0.0000*) and the mean difference were calculated to be 1.47. The Pearson Correlation Coefficient [PCC] of Group A, Pre and Post-treatment HbA1c value was 0.76, indicating Moderate correlation. Group B pre-treatment and post-treatment HbA1c values were 7.30±0.97 and 6.47±0.55 with t-value and p-value (10.60, 0.0000*) and the mean difference were calculated to be 0.83. The Correlation Coefficient of Group B pre and post-treatment HbA1c value was 0.89, indicating a Strong correlation.

The comparison of Pre-treatment and Post-treatment FBS values of Group A were 169.78±30.14 and 112.82±30.14 with t-value and P-value (13.16, 0.0000*) respectively and the mean difference was calculated to be 56.96. The PCC of Group A pre and post-treatment FBS values was 0.27, indicating a Weak correlation.

The comparison of Pre-treatment and Post-treatment values of Group B were 158.28±14.86and128.66±10.22with t-value and P-value (20.41, 0.0000*) respectively and the mean difference was calculated to be 29.62. The PCC of Group B, pre and post-treatment FBS values was 0.72, indicating moderate correlation.

PPBG values of Group A pre-treatment and post-treatment were 287.64±61.26 and 171.84±26.16 with t-value and P-value (15.38, 0.0000*) respectively and the mean difference was calculated to be 115.8. The PCC of Group A, Pre and Post-treatment PPBG values was 0.50, indicating moderate correlation.

The PPBG values of Group B pre-treatment and post-treatment were found to be 245.44±26.55 and 192.86±16.06 with t-value and P-value (17.15, 0.0000*) respectively and the mean was calculated to be 52.58. The PCC of Group B, Pre and Post-treatment PPBG values was 0.58, indicating moderate correlation. The mean difference reduction of PPBG in Group B is less than that of Group A.

From the above results, Group A (Metformin-Glimepiride) had shown higher control of HbA1c, FBS as well as PPBG Levels in three months duration. Therefore, the Metformin-Glimepiride combination is considered to be superior to the Metformin-Teneligliptin combination in the Indian Population.

CONCLUSION

In our present study, we assessed the efficacy of modern Sulphonylurea Glimeperide and Newer DPP-4 Inhibitor Teneligliptin as an add-on to T2DM patients who are presently on Metformin Therapy focusing on the fact that there is a very limited body of studies between Glimiperide and Teneligliptin.

From the results obtained from our study, we hereby conclude that, though there was no large difference in between the reduction in HbA1c values by two Groups, the Blood sugar levels i. e FBS and PLBS were significantly reduced by Group A(Metformin-Glimepiride combination) than Group B(Metformin-Teneligliptin combination) in three months.

Therefore, the Metformin-Glimepiride combination is considered to be more efficacious than the Metformin-Teneligliptin combination.

LIMITATIONS

There are certain limitations for our study, which firstly include the small size of the participants' i. e 100 for the ailment like Diabetes mellitus.

Secondly, Short term evaluation of the glycaemic indices for only three months which would oversee the fluctuations in FBS and PPBS, which could be easily affected by the Diet, lifestyle and also the level of medication adherence,

Third, Medication costs had influenced the drug of choice in our geographical area due to the socio-economic status of our patients. Hence, a cost-effective analysis of the above-used combinations should be conducted, which would crucially aid in achieving a patient-centered approach.

FUNDING

Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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