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Original Research Article

A Comparison of the Effectiveness and Safety of Glimepiride with Sitagliptin in Patients with Type 2 Diabetes Mellitus

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Abstract

Background: One of the key reasons why treating people with diabetes mellitus (DM) and society at large is expensive. To contrast sitagliptin safety and efficiency with glimepiride in Type 2 DM patients who are also being treated with metformin as a background.

Methods: From December 2021 to November 2022, this study was carried out at NMCH, Patna, Bihar. Eligible patients were randomly assigned to receive sitagliptin 100 mg and glimepiride 2 mg once daily as an add-on medication for 12 weeks. A pre-populated proforma was filled up with demographic data. All study participants/patients heard advice to keep up a healthy diet and exercise frequently. At week 0 and again at week 12, which is when the trial came to an end, all patients' HbA1C, FBS, weight, Alanine Aminotransferase (ALT), serum urea, and serum creatinine measurements were obtained. The primary goal was to reach the target HbA1C upper normal level at the end of the study.

Results: A total of 120 patients were enrolled in the experiment, with 60 in each group. There were 36 men and 24 women in group B, compared to 32 men and 28 women in group A. Group A utilising sitagliptin demonstrated a statistically significant decline in HbA1C and BMI when compared to the Glimepiride group. ($p<0.05$). The two groups' reductions in FBS were comparable ($p>0.05$). Hypoglycemia, diarrhoea, and vomiting were the most frequent adverse reactions in both groups. There was no statistically significant difference in the frequency of occurrence between the two groups ($p>0.05$).

Conclusion: The results of the current research show that sitagliptin, when taken in addition to metformin, improves glycemic control just as effectively as glimepiride and is well tolerated with no obvious side effects. Glimepiride fared worse than sitagliptin, which also had a decreased risk of hypoglycemia. In addition, it was well tolerated and caused weight loss when compared to glimepiride.

Keywords: Diabetes Mellitus, Sitagliptin, Glimepiride, HbA1C, BMI.

Introduction

In 2008, it was anticipated that 180 million people worldwide would have diabetes mellitus (DM), one of the most common chronic illnesses.[1] Because of sedentary lifestyles, obesity, high BMIs, decreased physical activity, and longer life expectancies, type 2 diabetes incidence and prevalence are rising dramatically. This high prevalence rate is one of the key factors contributing to the cost burden on patients and society. Type 2 diabetes dramatically worsens both macrovascular (coronary heart disease, cerebrovascular disease, and peripheral vascular disease) and microvascular (retinopathy, nephropathy, and neuropathy) issues.[2] The goal of existing therapy is to improve insulin sensitivity and reduce hyperglycemia. Because they primarily attempt to cure the fundamental issues and avoid complications connected to type 2 DM, these treatments are very attractive and need concentration. Nevertheless, despite the multitude of available effective medications, glycemic control deteriorates over time.[3]

Continual beta-cell dysfunction frequently results in glycemic control that is impossible to achieve. In order to decrease the chance of microvascular and macrovascular issues without placing patients at risk for hypoglycemia, the main goal of treatment is to regulate blood sugar levels by maintaining the HbA1C level between 6 and 7%.[4] To avoid negative effects from monotherapy's possible inability to maintain glycemic control, the majority of type 2 diabetes patients need to take numerous anti-diabetic drugs, either alone or in addition to insulin.[5]

Different anti-diabetic drugs currently available on the market lower blood glucose levels in different ways. However, their use and dosage titration are constrained by the distinct pharmacokinetic and pharmacodynamic properties of each one.[4]

The US Food and Drug Administration has approved the use of sitagliptin, an oral, once-daily, potent and highly selective dipeptidyl peptidase-4 (DPP-4) inhibitor, to help adults with type 2 DM improve their glycemic control when combined with diet and exercise.[4] Sitagliptin raises fasting and postprandial levels of intact incretins, such as glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1), by reducing the action of DPP-4.[6]

The release of insulin in response to meals is increased by incretins, which helps to control blood sugar levels. Additionally, GLP-1 aids in reducing glucagon secretion. The levels of blood glucose affect these two actions.[7] It can be given alone or in combination with metformin or a thiazolidinedione (pioglitazone or rosiglitazone) when either medicine alone is unable to control blood sugar levels. The usual dose for adults is 0.1g administered once daily. Take 25–50 mg once daily if you have moderate to severe renal impairment.[4] Sitagliptin and glimepiride were compared for safety and efficacy in patients whose metformin-alone management was unsatisfactory because there is limited information on the safety and effectiveness of this medicine in our community.

Material and Methods

From December 2021 to November 2022, this study was carried out in Nalanda Medical College and Hospital, Patna, Bihar. Eligible patients were randomly assigned to receive sitagliptin 100 mg and glimepiride 2 mg once daily as an add-on medication for 12 weeks. On a proforma that had already been filled out, the demographic characteristics of the research population, including age, gender, smoking history, and hypertension, were noted.

All participants were urged to maintain a cautious diet and engage in regular exercise during the duration of the trial. HbA1C, FBS, weight (Kg), Alanine aminotransferase (ALT), serum urea, and serum creatinine measurements were performed on all patients at week 0 and again at week 12, which marked the end of the trial. The primary goal was to achieve the target HbA1C upper limit normal (ULN) at the end of the study. Inclusion criteria for the current study include patients with type 2 diabetes, poor glycemic control on metformin alone, FBS and PPBS values greater than 100 mg/dl and 140 mg/dl, patients with HbA1C levels greater than 7%, and patients of both sexes.

Patients with type I diabetes mellitus (type I DM), pregnancy, impaired renal or hepatic function, uncontrolled diabetes (HbA1C >9% or fasting blood sugar (FBS) >300 mg/dl), uncontrolled hypertension, unstable angina, or a history of allergies or sensitivities to the research drugs were excluded from the trial.

The entire set of data was analysed using SPSS 17 for Windows. The sample size was calculated using PS software with an 80% power. When comparing the two groups, the chi-square (x^2) test for categorical variables and the student 't' test for continuous variables were both utilised. A p value of <0.05 or lower was deemed significant.

Results

A total of 120 patients were enrolled in the experiment, with 60 in each group. The group was selected using a randomization software. In the sitagliptin group (A), the mean age was 45, while in the glimiperide group (B), it was 47. There was no discernible variation in the groups' age distribution. There were 16 males and 14 females in group A, and 18 males and 12 females in group B. The average BMIs of the groups were also similar, with no statistically significant variations.

Table 1: Patients Demographic Data

	Sitagliptin	Glimiperide	p-value
Age in years (Mean±SD)	45.0±4.3	47.0±3.2	0.56
Sex (M/F)	16/14	18/12	0.76
BMI (Mean±SD)	23.0±2.5	22.0±2.9	0.64

Table 2: Baseline reading of HbA1C, FBS and BMI recorded and 2nd reading at 12 weeks follow up

	Sitagliptin Group		Glimiperide		p-value
	Baseline	12th week	Baseline	12th week	
HbA1C (%)	8.02±0.56	6.48±0.23	7.98±0.60	7.02±0.30	0.04
Fasting Blood Sugar (FBS)	170.±7.8	120.0±5.8	165.0±6.6	123.0±4.3	0.1
Body Mass Index (BMI)	27.0±2.1	24.1±1.5	28.0±2.3	27.03±1.6	0.02

Baseline measurements of HbA1C, fasting blood sugar, and BMI were recorded; a second measurement was taken during the 12-week follow-up. Both readings were compared and analysed using the student t test. There was a statistically significant difference between Groups A and B in the HbA1C and BMI follow-up. We found a significant reduction in HbA1C and BMI in group A when sitagliptin was used compared to the group receiving glimepiride. ($p<0.05$)

Reduction in FBS was comparable in both the groups. ($p>0.05$)

Table 3: Side Effect of both groups

	Sitagliptin Group	Glimiperide Group	p-value
Hypoglycemia	3	2	0.56
Diarrhoea	2	1	0.98
Vomiting	2	3	0.76
Others	1	2	0.44

Hypoglycemia, diarrhoea, and vomiting were the most frequent adverse reactions in both groups. There was no statistically significant difference in the frequency of occurrence between the two groups ($p>0.05$). These side effects were minimal, didn't require any pauses to prescriptions, and didn't result in any dropouts.

Discussion

Diabetes mellitus is a significant risk factor for a variety of outcomes, from organ failure to microvascular damage.[2] Maintaining blood glucose levels within the normal range is the main objective of treating DM. HbA1C is a measure for that metric that shows how well one's blood sugar levels were managed over the preceding two to three months. HbA1C levels between 6 and 7 percent are regarded as acceptable and show adequate DM control. [4] According to recommendations made by the American Diabetes Association, metformin and lifestyle changes should be considered first-line therapies for persons with type 2 DM. If step-1/first line therapy fails to sufficiently control DM and glycemic control is not attained, step-2 medicine, such as the use of sulfonylureas, thiazolinediones, or insulin, may be necessary. Metformin and TZDs, the two primary drugs used to treat diabetes, reduce insulin resistance; nevertheless, they have no effect in delaying the maturation of beta cell function, as is shown in type 2 DM patients. Therefore, more modern therapeutic approaches are needed. Attacking the hormone that mimics incretin is one of them. The incretin hormone GLP-1 is released when blood sugar levels are elevated. GLP-1 boosts beta-cell activity, increases insulin synthesis, decreases glucagon secretion, and delays gastric emptying. GLP-1 synthesis will decline in persons with type 2 diabetes. When GLP-1 is produced, the enzyme DPP-4 is in charge of its rapid breakdown.[8,9]

Therefore, GLP-1 hormone action can be prolonged by medications like sitagliptin that inhibit the DPP-4 enzyme. The quantity of insulin released and glucagon inhibited decreases as blood glucose levels go closer to normal, preventing the "overshoot" and eventual hypoglycemia that can occur with some other oral hypoglycemic medications. In our trial, participants in the Sitagliptin group reduced HbA1C more than those in the Glimepiride group did, but the difference was not statistically significant. Other research produced findings that were comparable. In the Arechavaleta *et al*. study [10], 65% of patients met the goal HbA1C level of 7%. Similar results were found in a trial by Charbonnelet *et al*.[11], where 47% of sitagliptin-using patients met their goal HbA1C.

Although there was no statistically significant difference between the two groups, FBS reduced in both of them. The results coincided with those of earlier studies. Sitagliptin decreased FBS by 63.9mg/dl in a trial by Goldstein *et al*. Sitagliptin decreased FBS from baseline by 50 mg/dl in the trial by Charbonnel et *et al*.[11], whilst glimiperide decreased it by 42 mg/dl. Patients in both the Sitagliptin and Glimiperide groups in our study had their BMI drop, although the sitagliptin group's drop was statistically

substantially bigger than the glimiperide group's. Similar findings were seen in a study by Nauck *et al*.[12] where the sitagliptin group lost significantly more weight than the glimepiride group. In our trial, no major adverse effects were found [13].

Conclusion

According to the outcomes of the current trial, sitagliptin looks to be equally as effective as glimepiride in enhancing glycemic control and is well tolerated with no severe side effects. It is also an add-on drug to metformin.

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