A Study of Effects of Pioglitazone and Rosiglitazone on Various Parameters in Patients of Type-2 Diabetes Mellitus with Special Reference to Lipid Profile

SK Sharma¹, SH Verma²

Abstract

Objectives: To study the complete fasting lipid profile and other parameters (weight, body mass index, HbA1c, fasting blood sugar and postprandial blood sugar) in Type 2 diabetes mellitus patients on OHA/insulin, to study the effect of addition of pioglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin, to study the effect of addition of rosiglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin and to compare the effect of pioglitazone and rosiglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin.

Material and Methods: In the study, 100 Type 2 diabetes cases on oral hypoglycemic agent/insulin with deranged lipid profile were chosen and divided into 2 groups 50 and 50 in group A and group B respectively. Pioglitazone was given initially 15mg/day then if required increasing upto 45mg/day in group A for period of 18 weeks and rosiglitazone was given initially 2 mg/day then if required increasing upto 8 mg/day in group B for period of 18 weeks. Detailed clinical history was obtained and thorough physical examination was done and following parameters were established-Age, Height, Weight, Body mass index, Fasting and Postprandial blood sugar, HbA1c levels and fasting complete lipid profile done at 0 and 18 weeks. Each patient itself served as a control for this study.

Results: Maximum no. of patients were in sixth decade (53.30%) and minimum patients were in seventh decade (6.6%). Males were 63.3% and females were 36.8%. Fasting blood sugar levels decreased by 23% with pioglitazone in group A and 14.07% with rosiglitazone in group B. The postprandial blood sugar levels decreased by 29.9% with pioglitazone in group A and 20.17% with rosiglitazone in group B. The mean HbA1c decreased by 2.13 % pioglitazone in group A and 3.8% with rosiglitazone in group B after 18 weeks of therapy. The effects of both drugs on BMI and weight were not significant. In group A the total cholesterol level decreased by 8.62% with pioglitazone but in group B there was no significant decrease in total cholesterol level after 18 weeks of therapy.

Editorial Viewpoint

• Both pioglitazone and rosiglitazone late to insignificant increase in BMI.
• Pioglitazone was better in controlling blood sugars than rosiglitazone.
• Pioglitazone effectively controlled cholesterol and triglyceride the levels as compared to rosiglitazone.
• Both drugs were hepatosafe.

Introduction

Diabetes mellitus is the most common endocrine disease worldwide. Prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and to rise to 5.4% by the year 2025. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. The countries with the largest number of people with diabetes are, and will be in the year 2025, India, China, and the U.S. The greatest increases will be seen in India from 19 million to 57 million).¹

Diabetes mellitus was a major cause of morbidity till a few
with rosiglitazone. There was no significant reduction in mean LDL cholesterol level in both groups. HDL-c level increased by 17.14% with pioglitazone in group A and decreased by 1.2% with rosiglitazone in group B. Triglycerides levels decreased by 12.33% with pioglitazone in group A and 6.16% with rosiglitazone in group B.

**Conclusion:** Treatment with pioglitazone and rosiglitazone both were associated with reduction in fasting and postprandial blood sugar levels but more with pioglitazone. There was significant reduction in HbA1c with both pioglitazone and rosiglitazone but more with rosiglitazone. The total cholesterol level decreased by pioglitazone significantly but not with rosiglitazone. The LDL levels were not affected much by both drugs, while HDL levels were significantly increased with pioglitazone. Triglycerides levels were decreased with both pioglitazone and rosiglitazone but more with pioglitazone. Both drugs are useful but pioglitazone proved to be more beneficial on deranged lipid profile as compared to rosiglitazone in Type 2 Diabetes mellitus patients on OHA/insulin.

decades back. Advent of insulin, oral hypoglycemic agents like sulphonylureas, biguanides, and thiazolidinediones are able to control blood sugar thus giving longer life to a diabetic patient. Thiazolidinediones are Peroxisome Proliferator Activated-Gamma agonists and are used for the treatment of type 2 Diabetes mellitus. Thes drugs enhance the cellular Insulin action on glucose and lipid metabolism, thus improve the glucose hemostasis and normalize the blood glucose levels in diabetics.  

Bohannon stated that both groups of insulin sensitzers (Metformin and TZDs) act on hepatic muscle and adipose tissues through different mechanisms to improve glycemic control, beta cell function and lipid profile but TZDs have a greater impact on free fatty acids than Metformin. They have an additive effect with sulfonylureas, Metformin or Insulin in improving glycaemic control and lipid profile.  

We have studied pioglitazone and rosiglitazone because there is no evidence of liver toxicity with these two TZDs.  

Some studies have reported greatest benefit with pioglitazone and least benefit with rosiglitazone. Differing effects on lipid profile were apparent from pioglitazone or rosiglitazone, despite similar weight increase and glycemic control. The clinical significance of these differences remains to be determined, and further comparative research is warranted.

**Aims and Objectives**

To study the complete fasting lipid profile and other parameters (weight, body mass index, HbA1c, fasting blood sugar and postprandial blood sugar) in Type 2 diabetes mellitus patients on OHA/insulin, to study the effect of addition of pioglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin, to study the effect of addition of rosiglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin and to compare the effect of pioglitazone and rosiglitazone on lipid profile and other parameters in Type 2 diabetes mellitus patients on OHA/insulin.

**Material and Methods**

In the study, 100 Type 2 diabetes cases on oral hypoglycemic agent/insulin with deranged lipid profile were chosen and divided into 2 groups 50 and 50 in group A and group B respectively. Pioglitazone was given initially 15 mg/day then if required increasing upto 45 mg/day in group A for period of 18 weeks and rosiglitazone was given initially 2 mg/day then if required increasing upto 8 mg/day in group B for period of 18 weeks. Each patient itself served as a control for this study. Exclusion criteria were patients of type I DM, patients with diabetic coma or precoma, patients with advanced hepatic, renal or cardiac diseases, pregnant and lactating females, patients allergic to drugs. Detailed clinical history was obtained and thorough physical examination was done and following parameters were established-Age, Height, Weight, Body mass index, Fasting and Postprandial blood sugar, HbA1c levels and Fasting complete lipid profile done at 0 and 18 weeks. Besides these some routine investigations were done, Hb, TLC, DLC, ESR, LFT, S. Creatinine, routine and microscopic urine examination. Body mass index was calculated by formula Weight in Kg/ Height in meter 2. Estimation of blood sugar levels were done by peroxidase method at 0 and 18 weeks. Fasting samples were taken and lipid profile was estimated from the serum using lipid profile kit with the help of semiautoanalyser.

**Results**

**Results:** The highest number of cases 27 (54%) were in the age group of 51 -60 yrs in group B where as as the highest number of cases 24 (48%) were in the same age group in group A. There were 31 males (62%) in group A and 34 males (68%) in group B in comparison to 19 females (38%) in group A and 16 females (32%) in group B. Fig 1 shows age and sex distribution in study population.

In group A, the mean weight of patient was 64.80±2.587 Kg at 0 week and had changed to 65.57±1.870 Kg at 18 weeks but these changes were not significant (p>0.05). Mean BMI of patient 24.9±1.60 Kg/m2
Discussion

Advent of thiazolidinediones
is a major breakthrough in the treatment of diabetes. In this study it was observed that most of the patients were in the fifth decade (51\%) and minimum number was in the sixth decade (8\%) of life, male constituted about 65\% and female were 35\%. A study by Gupta et al\textsuperscript{8} showed the maximum prevalence of Type 2 diabetes in sixth decade (13.6\%) of life. Dakshina Murthy et al\textsuperscript{9} found the prevalence to be maximum in fourth and fifth decade. Males were 64.4\% and females 35.6\% of total cases which is comparable to the values of present study. Ghosh et al\textsuperscript{10} observed that male constituted 81.5\% and females were 18.48\% of the total number of cases, similar was the observation of Tripathy et al\textsuperscript{11}.

In the present study, fasting blood glucose levels, post prandial blood glucose levels level decreased significantly with pioglitazone and rosiglitazone but more with pioglitazone. Statistically significant decrease was observed in mean HbA1c with both pioglitazone and rosiglitazone in our study. Similarly Yoshinori Miyazaki et al\textsuperscript{12} observed significant decrease in fasting blood glucose levels and in mean HbA1c with pioglitazone. Our present study is in agreement with the previous studies by Aronoff S et al,\textsuperscript{13} Sydney R et al\textsuperscript{14} who observed significant reduction in fasting blood glucose and mean HbA1c with pioglitazone while Khan et al\textsuperscript{15} studied pioglitazone and rosiglitazone with similar glycemic control.

In present study there was significant decrease in total cholesterol and triglycerides levels with pioglitazone as compared to rosiglitazone. The changes in LDL cholesterol levels were not significant with pioglitazone and rosiglitazone but HDL cholesterol level increased significantly with pioglitazone as compared to rosiglitazone in present study. Similarly by Aronoff S et al,\textsuperscript{13} Sydney R et al\textsuperscript{14} observed significant decrease in total cholesterol and triglycerides levels and significant increase in HDL cholesterol levels with pioglitazone as compared to rosiglitazone. The change in LDL cholesterol level was not significant in present study and above mentioned studies. While in a study by Khan et al,\textsuperscript{15} statistically significant improvement was observed in all lipid components with pioglitazone but positive changes were seen in only HDL cholesterol level with rosiglitazone. Patrick et al\textsuperscript{16} observed significant reduction in triglycerides levels with pioglitazone as compared to rosiglitazone which is in agreement to present study but total cholesterol levels were increased with rosiglitazone in study by Patrick et al.\textsuperscript{3} The HDL cholesterol level was not much increased with rosiglitazone in present study while Patrick et al observed reduction in HDL cholesterol level with rosiglitazone. In present study LDL cholesterol levels were not changed significantly with both pioglitazone and rosiglitazone but Patrick et al\textsuperscript{5} observed reduction in LDL cholesterol with pioglitazone and increase in LDL cholesterol levels with rosiglitazone.

Gegnick and Althein et al\textsuperscript{17} experienced statistically significant decrease in total cholesterol levels with pioglitazone, similar to present study but he experienced significant increase in total cholesterol and triglycerides levels with rosiglitazone in contrast to present study. King and Armstrong et al\textsuperscript{18} described greatest benefit with pioglitazone and least benefit with rosiglitazone.

Conclusions

Treatment with pioglitazone and rosiglitazone both were associated with reduction in fasting and postprandial blood sugar levels but more with pioglitazone. There was significant reduction in HbA1c with both pioglitazone and rosiglitazone but more with pioglitazone.

The effects of both drugs on BMI and weight were not significant. The total cholesterol level decreased by pioglitazone significantly but not with rosiglitazone. The LDL levels were not affected much by both drugs, while HDL levels were significantly increased with pioglitazone. Triglycerides levels were decreased with both pioglitazone and rosiglitazone but more with pioglitazone.

Weight gain was reported only in 9 patients receiving pioglitazone and 3 patients receiving rosiglitazone. Hepatotoxicity was not seen with pioglitazone and rosiglitazone.

Therefore, it is concluded that “Both drugs are useful but pioglitazone proved to be more beneficial on deranged lipid profile as compared to rosiglitazone in Type 2 Diabetes mellitus patients on OHA/insulin but still further comparative research is warranted.”

References

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