World Academy of Science, Engineering and Technology
International Journal of Pharmacological and Pharmaceutical Sciences
Vol:10, No:03, 2016

Development of an Experimental Model of Diabetes Co-Existing with Metabolic Syndrome in Rats

Authors : Rajesh Kumar Suman, Ipseeta Ray Mohanty, Manjusha K. Borde, Ujjawala maheswari, Y. A. Deshmukh

Abstract : Background: Metabolic syndrome encompasses cluster of risk factors for cardiovascular disease which includes abdominal obesity, dyslipidemia, hypertension, and hyperglycemia. The incidence of metabolic syndrome is on the rise globally. Objective: The present study was designed to develop a unique animal model that will mimic the pathological features seen in a large pool of individuals with diabetes and metabolic syndrome; suitable for pharmacological screening of drugs beneficial in this condition. Material and Methods: A combination of high fat diet (HFD) and low dose of streptozotocin (STZ) at 30, 35 and 40 mg/kg was used to induce metabolic syndrome co-existing with diabetes mellitus in Wistar rats. Results: The 40 mg/kg STZ produced sustained hyperglycemia and the dose was thus selected for our study to induce diabetes mellitus. Rat fed HFD (HF-DC) group showed significant ($p < 0.001$) increase in body weight on 4th and 7th week as compared with NC (Normal Control) group rats. However, the increase in body weight of HF-DC group rats was not sustained at the end of 10th weeks. Various components of metabolic syndrome such as dyslipidemia {(Increased Triglyceride, total Cholesterol, LDL Cholesterol and decreased HDL Cholesterol)}, diabetes mellitus (Blood Glucose, HbA1c, Serum Insulin, C-peptide), hypertension {Systolic Blood pressure ($p < 0.001$)} were mimicked in the developed model of metabolic syndrome co existing with diabetes mellitus. In addition significant cardiac injury as indicated by CPK-MB levels, artherogenic index, hs-CRP. The decline in hepatic function {($p < 0.01$) increase in the level of SGPT (U/L)} and renal function {(increase in creatinine levels ($p < 0.01$)} when compared to NC group rats. The histopathological assessment confirmed presence of edema, necrosis and inflammation in Heart, Pancreas, Liver and Kidney of HFD-DC group as compared to NC. Conclusion: The present study has developed a unique rodent model of metabolic syndrome; with diabetes as an essential component.

Keywords : diabetes, metabolic syndrome, high fat diet, streptozotocin, rats
Conference Title : ICPMPS 2016 : International Conference on Pharmacology, Medicinal and Pharmaceutical Sciences
Conference Location : Singapore, Singapore
Conference Dates : March 03-04, 2016