Summary
Summary of results

Of late diabetes becomes an epidemic worldwide especially the developed countries pertaining to their lifestyle. It takes a huge toll on human life. Diabetes is in fact a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion and/or the mode of insulin action. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs like eye, kidney, nervous system and heart dysfunction. The present study was aimed to dissect the mechanism of diabetic cardiomyopathy and to elucidate the role of oxidative and nitrosative stress. However, our study also envisaged the role played by various antioxidants defending the heart from diabetic cardiomyopathy.

Our findings well supported that hyperglycemia induced apoptosis in H9C2 cardiac muscle cells via generation of ROS and RNS and mitochondrial death pathways. NAC, catalase and GSH exerts a protective effect on cardiac cells. ROS and RNS formed as a result of glucose oxidation causes mitochondrial depolarization, downregulation of Bcl-2 and upregulation of Bax. Mitochondrial depolarization and upregulation of Bax helps in the release of cytochrome c further results in caspase activation which ultimately leads to apoptosis. However, a more precise action mechanism of NAC catalase and GSH on these molecular targets could be delineated in further studies.

Further our in vivo studies also provides the evidence that diabetes causes cardiovascular complication as manifested by increases in serum cardiac troponin I (cTnI) and changes in physiological parameters such as left ventricular diastolic and systolic function. Diabetic cardiomyopathy is a multiple factorial diseases, caused mainly due to the generation of reactive oxygen and nitrogen species to cause oxidative and nitrosative stress. Changes in lipid profile (dyslipidemia), upregulation of pro and downregulation of anti-inflammatory cytokines have been observed. We have also showed the upregulation of pro-oxidant like XO, MAO-A, 5-LO and COX-2, proapoptotic and decrease in antiapoptotic genes in diabetic heart. Multiple antioxidants supplementation was able to significantly attenuate or suppress all the factors induced due to diabetes and protect the heart from diabetes.
induced cardiomyopathy. Other biochemical parameters such as uric acid, alkaline phosphatase, serum glutamic oxalacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) levels indicate that an antioxidant regimen used in the present study is not toxic to other organs.

Our study supports an essential and important pathological role of oxidative and nitrosative stress in diabetic cardiomyopathy and multiple antioxidants supplementation was able to protect diabetic cardiomyopathy in diabetes. We also showed that supplementation with the adequate and appropriate antioxidant mixture is fruitful.