Scope of the Present Study
Acquisition of life styles such as adoption of atherogenic diet and sedentary habits in parallel with economic development have increased the incidence of non–communicable diseases, of which CVD ranks first among the other killer diseases including cancer. High fat diet is considered as one of the important and independent risk factor for the development of several diseases and disorders, the most important being hyperlipidemia mediated CVD. It has been predictable that CVD will be the most important cause of mortality in India by the year 2015.

Any hypolipidemic agent should decrease LDL cholesterol by 15% and TG by 30% to justify the expense of continuation of the drug and also the potential dangers of side effects. Most lipid lowering drugs currently used in the treatment of hyperlipidemia have their own limitations. The synthetic drugs are proved to be more dangerous in producing complications. Many traditional plants are claimed to be useful in controlling hyperlipidemia and its complications.

Much attention has been focused on the dietary intake of PUFA from seafood including fish oil which is reported to have ω-3 fatty acids. Currently, research interest is directed towards the significance of ω-3 fatty acids as a rich source in diet.
Flaxseed oil is one such rich source of ω-3 fatty acids and lignans. Studies have identified it to be a potent antioxidant. However, so far the biochemical mechanisms involved in protection offered by flaxseed oil against HFD have not been identified. Hence, in the present study, it was considered worth while to study and to evaluate the protective effect of flaxseed oil against HFD through biochemical analysis. Rat model was chosen for the study and the following parameters were assessed.

- Preliminary studies on body weight, organ weights and plasma lipid profile were performed with different concentrations of flaxseed oil for different time intervals in order to fix the effective / optimum dose and also to establish the non-toxic nature of flaxseed oil.

- Histopathological and electrocardiographic studies were carried out to establish the effectiveness of flaxseed oil in high fat diet condition.

- Assessment of serum pathophysiologica enzymes such as CK, LDH, AST, ALT, ACP, ALP and general biochemical parameters like blood glucose, urea, plasma protein, serum uric acid, serum creatinine and plasma homocysteine levels provide means for better understanding of the efficacy of flaxseed oil in counteracting the effect of HFD and its non-toxic effect.
Haematological studies - RBC count, platelet count, haemoglobin content, haematocrit value, prothrombin time and levels of fibrinogen were carried out to assess the efficacy of the flaxseed oil in maintaining normal blood homeostasis.

Activities of membrane bound ATPases in erythrocytes, heart and liver tissues were assessed to find out the protective effect of flaxseed oil against membrane damage.

Levels of Na\(^+\), K\(^+\), Ca\(^{2+}\) and Mg\(^{2+}\) ions in the heart were estimated to assess the effect of the flaxseed oil on ionic balance.

Studies have been conducted on lipid peroxidation, enzymic and nonenzymic antioxidant status (TBARS, GSH and the activities of SOD, CAT, GPx, GST) in erythrocytes, heart and liver tissues to establish the antioxidant property of flaxseed oil.

Lipid and lipoprotein profile – Assessment of lipids (total, free and esterified cholesterol, TG, PL and FFA levels in heart, aorta and liver tissues), activities of lipid metabolizing enzymes in the plasma such as CES, CEH, LCAT, LPL and liver HMG CoA reductase, plasma lipoprotein levels (HDL, LDL, VLDL, LDL:HDL, TC:HDL) and analysis of lipoproteins by agarose gel electrophoresis were performed to study the efficacy of flaxseed oil in alleviating the effects of HFD.
Fecal sterols, bile acids and the extent of hepatic bile acid excretion were assessed to reveal the beneficial effect of flaxseed oil on lipid metabolism.

LDH isoenzyme pattern by agarose gel electrophoresis were also performed in the serum of experimental rats to study the protective effect of flaxseed oil.

Scanning electron microscopic studies were done to reveal the structural changes of the aortic section in rats.