The ultimate goal of the study was to develop a stable, cost effective modified release dosage form of highly soluble drugs such as Trimetazidine dihydrochloride, Glucosamine hydrochloride and Tramadol hydrochloride. It was further aimed to perform the bioavailability and bioequivalence studies for selected model drugs i.e. Trimetazidine dihydrochloride and Glucosamine hydrochloride. Initially the drug-polymer interactions were studied for three model drugs with excipients by physical observation, chemical analysis and FTIR studies. The results found that three model drugs were compatible with excipients present in the study.

Trimetazidine dihydrochloride modified release tablets were prepared by direct compression technique by using Xanthan gum and Polyethylene oxide as release modifiers in different concentrations.

Glucosamine hydrochloride tablets were prepared by wet granulation technique by using HPMC K100M and HPMC K200M as a rate controlling polymers in different concentrations.

Tramadol hydrochloride tablets were prepared by direct compression technique by using Kollidon SR, Xanthan gum and Polyethylene oxide as controlled release polymers in different concentrations.

All prepared tablets of three model drugs were evaluated for Physico chemical characteristics such as Appearance, Hardness, Friability, Average weight, Assay, Related substances and in-vitro
dissolution studies. The results found satisfactory and met pharmacopoeial standards. Finally the release profile of optimized formulation was compared with reference product and calculated similarity factor $f_2$ and found within the limit.

As per the ICH guidelines the stability studies were carried out for optimized formulations at accelerated conditions i.e. 40°C/75% RH for a period of 6 months and carried out Assay, Dissolution, Hardness and Related substance. From the stability results it revealed that up to 6 months the tablets were passed the pre-defined specification limits, impurities are well controlled and there is no change in the drug release throughout the stability period.

The *in-vivo* studies were carried out for optimized formulation of Trimetazidine dihydrochloride and Glucosamine hydrochloride in human adult healthy subjects under two-way cross over design. The results found that Trimetazidine dihydrochloride test product (TMZ11) when compared with reference product i.e. Preductal MR met the bioequivalence criteria with respect to the rate and extent of absorption and Glucosamine hydrochloride test product (GSM07) showed improved bioavailability of 56.95% when compared to immediate release product (Bioglan). Finally the overall objectives were fulfilled and proved in present study.