10. Conclusions

Oral delivery is the widely employed and most convenient route for delivery of therapeutic agents. However, poor physicochemical properties of drug molecules hinder the oral administration by limiting the oral bioavailability of drugs. The present research work would be an enormous contribution in the existing scientific literature for opening a new avenue in the field of oral drug delivery. It represents an exciting advancement in the search of novel delivery system for harnessing the potential of poorly permeable hydrophilic drug molecules, by extrapolating the intriguing findings of tunable nanocarrier systems. The experimental findings are convincing and provided a deep insight into the captivating features of various nanocarrier systems for enhancing the oral bioavailability of CS like poorly permeable hydrophilic drug molecules, by improving permeability across GIT.

In the present study, CS was successfully encapsulated into four different types of nanocarrier systems, i.e., CS-PNs, CS-SLNs, CS-PLHNs and CS-PCCSNs. Both *ex-vivo* and *in-vivo* experiments suggested a significant increase in the oral permeability and thereby, bioavailability of CS by formulating nanocarrier systems as compared to pure CS. Improved pharmacokinetic profile of CS after oral administration would thus, allow to reduce dose and dosing frequency, causing improved patient compliance. The potential of nanocarrier systems was also confirmed by significant improvement in the therapeutic efficacy during the *in-vivo* studies. Further, extensive preclinical and clinical studies need to be performed for their utilization in the current clinical pharmacotherapy with greater efficacy in various diseases.

When the potentials of all the developed four nanocarrier systems were compared in terms of encapsulation efficiency, *in-vitro* drug release, storage stability, *ex-vivo* intestinal permeation and *in-vivo* pharmacokinetic studies, results suggested that PCCSNs have a better potential to deliver CS like poorly permeable hydrophilic drug molecules orally, compared to other developed nanocarrier systems. Thus, with the successful development of nanocarrier systems capable of improving the oral delivery potential of CS, the objective of present research work was dully accomplished and will definitely help in the selection of nanocarrier system for the effective oral delivery of poorly permeable hydrophilic drugs.