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Timolol maleate loaded chitosan mucoadhesive nanoparticles for ocular drug delivery system

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Many effective anti-glaucoma drugs, available for the treatment of ocular hypertension and open angle glaucoma are associated with rapid and extensive pre-corneal loss, caused by the drainage and high tear fluid turnover. The objective of this study involved the design of mucoadhesive nanoparticulate carrier system containing Timolol Maleate for ocular delivery to improve its corneal absorption. Nanoparticles were synthesised by template polymerization method and the process optimization using different combination ratios of mucoadhesive polymers was carried out. The developed nanoparticles loaded in mucoadhesive polymer had a particle size of 141.29 ± 2.4nm which is ideal for ocular delivery with zeta potential of 23.30-25.4mV. In comparison to the marketed formulation, the in vitro release studies of optimised nanoparticulate mucoadhesive in simulated tear fluid, exhibited a biphasic release pattern with an initial burst followed by sustained release up to 12h. The release kinetics showed anomalous diffusion. The potential irritancy of nanoparticles was evaluated using HET-CAM method and it was found to be non-irritant. Transcorneal permeation data obtained using goat cornea revealed a sustained permeation profile from nanoparticle formulation in reference to the marketed formulation. Thus, our studies demonstrate that developed nanoparticles are a viable alternative to conventional eye drops and offer a promising delivery system for management of glaucoma.

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