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Increasing Solubility and Bioavailability of Fluvastatin through Transdermal Nanoemulsion Gel Delivery System for the Treatment of Osteoporosis

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Abstract : Fluvastatin has been reported for increasing bone mineral density in osteoporosis since last decade. Systemically administered drug undergoes extensive hepatic first-pass metabolism, thus very small amount of drug reaches the bone tissue which is highly insignificant. The present study aims to deliver fluvastatin in the form of nanoemulsion (NE) gel directly to the bone tissue through transdermal route thereby bypassing hepatic first pass metabolism. The NE formulation consisted of isopropyl myristate as oil, tween 80 as surfactant, transcutol as co-surfactant and water as the aqueous phase. Pseudoternary phase diagrams were constructed using aqueous titration method and NE's obtained were subjected to thermodynamic-kinetic stability studies. The stable NE formulations were evaluated for their droplet size, zeta potential, and transmission electron microscopy (TEM). The nano-sized formulations were incorporated into 0.5% carbopol 934 gel matrix. Ex-vivo permeation behaviour of selected formulations through rat skin was investigated and compared with the conventional formulations (suspension and emulsion). Further, in-vivo pharmacokinetic study was carried using male Wistar rats. The optimized NE formulations mean droplet size was 11.66±3.2 nm with polydispersity index of 0.117. Permeation flux of NE gel formulations was found significantly higher than the conventional formulations i.e. suspension and emulsion. In vivo pharmacokinetic study showed significant increase in bioavailability (1.25 fold) of fluvastatin than oral formulation. Thus, it can be concluded that NE gel was successfully developed for transdermal delivery of fluvastatin for the treatment of osteoporosis.

Keywords : fluvastatin, nanoemulsion gel, osteoporosis, transdermal
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