

Development and Evaluation of Gastro Retentive Microspheres for Anticonvulsant Drugs

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Abstract: Background: Gastroretentive drug delivery systems are designed to prolong gastric residence time and improve drug bioavailability. Floating microspheres are particularly useful for drugs that require controlled release and extended gastric retention. The present study aimed to develop and evaluate floating gastroretentive microspheres containing **Gabapentin** and **Nortriptyline** for sustained drug delivery. **Objective:** The objective of this study was to formulate floating gastroretentive microspheres using different polymer concentrations and evaluate their physicochemical properties, buoyancy behavior, drug entrapment efficiency, swelling characteristics, and in-vitro drug release profile. **Methods:** Floating microspheres were prepared by the solvent evaporation technique using hydroxypropyl methylcellulose (HPMC K15M) and ethyl cellulose as polymeric carriers. Twelve formulations (F1–F12) were developed by varying polymer concentrations. The prepared microspheres were evaluated for micromeritic properties, particle size distribution, swelling index, drug loading, entrapment efficiency, in-vitro buoyancy, and drug release behavior. Drug release studies were performed in simulated gastric fluid for 12 hours. The optimized formulation was further subjected to stability studies for three months under accelerated conditions. **Results:** The microspheres exhibited satisfactory micromeritic properties with bulk density ranging from 0.37 to 0.49 g/mL and angle of repose between 26.8° and 31.2°, indicating good flow characteristics. Particle size ranged from 168.4 μm to 246.4 μm. Entrapment efficiency varied between 71.4% and 89.5%, while drug loading ranged from 18.6% to 26.2%. In-vitro buoyancy studies showed floating ability between 68.4% and 89.6%. The optimized formulation (F10) demonstrated sustained drug release up to 12 hours with nearly complete drug release and excellent buoyancy. Stability studies indicated no significant changes in physicochemical parameters during storage. **Conclusion:** The developed floating gastroretentive microspheres successfully provided sustained drug release and prolonged gastric retention. The optimized formulation exhibited desirable micromeritic properties, high entrapment efficiency, and excellent floating ability, suggesting its potential as an effective gastroretentive drug delivery system for controlled release therapy.

Keywords: Floating gastroretentive microspheres, gastroretentive drug delivery system, Gabapentin, Nortriptyline, solvent evaporation method, controlled drug release, buoyancy, polymeric microspheres.

