optimally absorbed in the small intestine, 5-acetylsalicilic acid for colon-specific delivery for colitis, absorption of proteins and peptides such as amylin, and nonpeptides such as oxyprenolol, in the colon [45, 47].

The most commonly formulated enteric-coated dosage forms are tablets, pellets, and granules. Coated pellets and granules have an advantage over tablets as they have uniform release and reproducibility that ensures minimum intersubject variability in the bioavailability of the drug. When compared with single-unit dosage forms, multiparticulates have a more reproducible transit time through the stomach. Coated granules or pellets are usually filled into a capsule shell or compressed into a tablet. They can also be formulated as mini tablets into the capsules as a new approach to drug release. As it is directly compressed, it avoids the use of solvent when incorporating the drug into the substrate for coating [12].

5.2. Polymers Used for Enteric Coating and Its Mechanism

Polymers have emerged in areas of research for their use in the modified release of the drugs. They are administered as oral dosage formulations in the form of binders or coatings. The enteric coating polymers remain protonated and insoluble in the gastric conditions of the stomach, and they erode in intestinal conditions and release the drug. The ideal properties of enteric-coated materials include resistance to gastric fluids, capability to form a continuous film, inertness, nontoxicity, economical, high compatibility and nonreactive to other ingredients of the formulations good susceptibility and permeability to fluids in the intestine, and must have an easy application [42, 47, 48].

Enteric-coated tablets have polymeric layers that protect them from getting released into site that does not facilitate maximum absorption of drugs or cause the degradation of the drugs. They usually entail three layers from inside out; namely, a drug containing core reserve, a swellable coated layer comprising a hydroxypropyl cellulose layer, which controls the release of drug based on time, and a enteric coating layer composed of polymers entailing acid-resistance functions such as CAP, CAT, and hydroxy propyl methylcellulose phthalate (HPMCP). Because of the resistance of the enteric-coated polymer, the drug is not released in the stomach and passes through the GIT in intact form to the intestine. After gastric emptying, the enteric coating dissolves rapidly, leading to the contact of coated polymer layer with intestinal fluids where they erode and cause the release of the drug [45, 47].

The use of enteric coating has various advantages over an immediate release formulation that is formulated without any coating. Some of the advantages of enteric coatings are that they prevent drug degradation from adverse environmental conditions of stomach, protect any irritations caused to the stomach by drugs; and also prevent any disruption to normal flora, facilitate absorption of drugs to the site that shows maximum extent, and deliver the drugs intended for local action in the intestine [42, 45]. Some commercial enteric-coated products of sodium salt of mycophenolic acid, omeprazole, and diltiazem are very much appreciated and provide the improved efficacy [49–51].

There are numerous advantages of enteric-coated dosage form. However, they are associated with certain limitations such as delayed drug release, leading to delayed absorption and consequentially delayed onset of action. Drug complexation in intestinal content and drugs having poor solubility in the intestinal environment will have reduced solubility due to which there will be reduced bioavailability [42, 45]. Therefore, advancement in such systems with a newer technology can overcome such issues in the future.

6. OSMOTIC DRUG DELIVERY SYSTEMS

The conventional drug delivery systems have very minimal control over their drug release and close to no control over the optimum successful concentration at the required site of action. This drawback holds back oral delivery systems as there is no constant plasma concentration reached, but through the emergence of controlled drug delivery systems this problem was tackled. Among the various techniques that have got significant importance in the controlled drug delivery systems, ODDS is the most suitable one for providing the steady-state concentration for a prolonged time. This type of delivery systems deliver with zero-order kinetics, not depending on the concentration and physiological factors of the GI factors. The driving force for this systems is osmotic pressure [13, 52, 53].

The basic principle behind the ODDS is osmosis. Osmosis is defined as the movement of solvent molecules across a semipermeable membrane from lower concentration to higher concentration [54]. Osmotic pressure is created when excess of solvent molecules pass in one direction. The rate of drug delivery from the ODDS is directly proportional to the osmotic pressure created by the imbibition of fluids by osmogen. As osmotic pressure is a colligative property of a system under consideration, the magnitude of the osmotic pressure is dependent on