1. Introduction

Musculoskeletal diseases or disorders such as arthritis, osteoporosis, osteonecrosis, bone fracture, bone tumor, trauma due to sports, war and/or road traffic injuries, back pain and other spinal disorders cost society over $250 billion annually in the USA, and affects hundreds of millions of people across the world. It is estimated that around 10 million Americans have osteoporosis, and about 34 million are at risk of getting this disease. Osteoporosis caused 2 million fractures costing over $19 billion in 2005, and this is expected to rise to 3 million fractures by 2025, costing over $25 billion per year [1]. For load-bearing implants, over 200,000 hip replacements are performed each year in the USA, and this number is increasing steadily due to increased life expectancy [2]. More and more younger patients are in need of total hip replacement (THR) due to increased daily life activities or a more active lifestyle. Thus, the American Academy of Orthopedic Surgeons (AAOS) has categorized musculoskeletal conditions as the number one reason why patients visit a doctor [3]. Considering the tremendous impact of musculoskeletal conditions on our population and economy, the years 2000–10 had been proclaimed as the Bone and Joint Decade globally; and the years 2002–11 have been marked as Bone and Joint Decade in the USA [4].

Bone and Joint Decade is to increase the awareness and advance the understanding of musculoskeletal disorders through prevention, education and research to improve the quality of life for people with musculoskeletal disorders. A sharp rise in musculoskeletal diseases and disorders often demands a drug treatment at the specific surgery/injury/defect site. In bone tissue engineering, the term “drug” is not limited to only therapeutic agents such as antibiotic, anticancer, anti-inflammatory. The scope of the term “drug” has grown over the last few decades to include growth factors, bioactive proteins, enzymes, and non-viral genes (DNAs, RNAs). Different growth factors, bioactive biomolecules, and drugs are used in bone tissue engineering to induce osteoinductivity in the implanted biomaterials to accelerate the healing process to address various musculoskeletal disorders. Thus, the application of drugs in bone tissue engineering is very wide and a rapidly growing research field of interest.

To be used as a drug carrier, the potential substance must have the ability to incorporate a drug either physically or chemically, retain the drug until it reaches the specific target site, be gradually degraded, and deliver the drug in a controlled manner over time [5]. All these criteria are well met by calcium phosphates (CaPs), and as a result, these materials are promising candidates for drug delivery applications. CaPs are widely used in bone tissue engineering for hard tissues such as teeth or bone replacement, augmentation, and/or regeneration due to their excellent bioactivity and compositional similarities to bone mineral [6–10]. Table 1