Advances in Pharmacology and Pharmacy 6(2): 43-49, 2018 http://www.hrpub.org
DOI: 10.13189/app.2018.060202

Effect of Quercetin Supplement on Some Bone Mineralization Biomarkers in Diabetic Type 2 Patients

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Abstract Background: Diabetes associated with multiple metabolic problems in the body, including bone mineralization remodeling, osteoporosis and increase risk of fracture. Quercetin is natural flavonoids and according to animal studies; it has potent antioxidant, antidiabetic and protective effect against bone loss due to various causes. Objectives: explore effect of quercetin as nutritional supplement administrated orally on some bone mineralization bio-markers such as calcium, vitamin D and osteocalcin in Iraqi diabetic patients. Methods: interventional double-blind placebo randomized controlled study in which 40 patients with type 2 diabetes mellitus (age range 40-45) assigned randomly (using simple randomization) in either control (n=20) or study (n=20) group. Study group received Quercetin oral supplement as 500mg capsule once daily for three months. Venous blood was used for measuring Serum calcium, 25(OH) vitamin D and osteocalcin at base line and after 3 months. Results: After 3 months treatment with Quercetin; levels of Osteocalcin (28.1±7.6), serum calcium (9.2±1.8) and 25(OH) vitamin D (26.6±8.7) were significantly ($p<0.05$) higher than pretreatment values of osteocalcin (24.0±8.6); serum calcium (7.0±2.2) and 25(OH) vitamin D (20.6±7.7) and control values of serum calcium (6.8±2.0) and 25(OH) vitamin D (20.8±7.4), but not Osteocalcin (25.2±9.0). There was also significant correlation between use of quercetin; elevation of serum calcium and osteocalcin ($r= 0.454$; $p= 0.032$), indicating modulation in bone mineralization. Conclusions: Quercetin's use in diabetic patients may elevate Serum level of Calcium; 25(OH) vitamin D and may modulate bone mineralization represented by elevation of osteocalcin.

Keywords Quercetin, Osteocalcin, Diabetes, 25(OH) Vitamin D, Calcium

1. Introduction

Diabetes recently is considered as global health problem that affect large number of people and wide range of ages. Diabetes also responsible for increase morbidity and mortality rates among diabetic people where it related to a lot of complications; incidence of these complications accelerated when there is insufficient control on blood glucose level. These complications are categorized into microvascular or macrovascular [1] in addition to that; Recently evidences suggest that the bones probably may be affected by uncontrolled diabetes [2] and diabetes patients have greater risk for fracture as compared with normal individual at same age [3]. The elevated risk of bones fragility in those patients may be related to many factors like oxidative stress, hyperglycemia, accumulation of advanced glycation end products. These may produce great change in the metabolism inside bones lead to affect their strength and/or their structure [4]; and fast bone loss and development of osteoporosis [5, 6]. Many biomarkers level may be changed due to effect of Diabetes on bones such as osteocalcin; a bone formation marker, and CTX-1, bone resorption marker, were significantly lower in diabetics [7]. Other markers like IGF1 is found to be lower in in postmenopausal women with type 2 diabetes, while Serum concentrations bone formation inhibitor produced by the osteocyte called sclerostin, is elevated [8]. Circulating osteoprogenitor cells are; a novel bone metabolism marker [9] is measured by flow cytometry, found at lower level in patients with type 2 diabetes. [9, 10]

Diabetes also may affect bone cells directly; in type 2 Diabetes; in state of excess insulin; there were increases histo-morphometric indices of bone formation by two to three times through stimulates osteoblast proliferation [11], according to some in-vitro studies excess insulin also affect osteoblasts and promotes bone resorption [12] and associated with an increased Bone mineral density and might be related to a lower fracture rate [13].

Medications used for diabetes treatment found have variable effects on bone; in large population-based case-control showed use of insulin cause a no significant elevation in risk of any fracture [14]. Metformin effect was