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A Review On Traditional Herbs For Bone Health

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Abstract

The intricate balancing act between matrix deposition, mineralization, and resorption occurs during bone metabolism. The basic bone multicellular unit's coordinated remodelling activity, which is controlled by oestrogen, growth factors, and other kinase signalling pathways, is necessary for the healthy bone. This balance is most frequently impacted when the breakdown mechanism prevails over the restoration process. Aging becomes the undeniably most important factor in bone loss when people are in excellent health, eat well, and don't have any serious illnesses. Current anti-osteoporotic medications, including bisphosphonates, selective oestrogen receptor modulators, and hormone replacement therapy, are all aimed at these routes, but they also have limitations. Bone disorders majorly including osteoporosis and osteoarthrtis are becoming prevalent with the growth in the aging population. Significant drawbacks like burning sensation and gastrointestinal tract disturbances from these available conventional therapies have led to the increased interest in complementary and alternative medicine for treatment and prevention. There is strong evidence now that dietary and herbal remedies can influence these processes, especially by decreasing bone resorption, which benefits the skeleton. Plants are more potent healers because they promote the repair mechanism in the natural way. This paper reviews about few traditionally used herbs such as *Tinospora cordifolia, Cedrus deodara, Cissus quadrangularis, Ormocarpum sennoides and Ficus benghalensis* with their activities enhancing bone health. These herbs have the potential to be developed further as agents, alone or in combination with other drugs, to prevent or delay the onset of osteoporosis and osteoarthrtis reducing the risk of bone damage.

Keywords: Bone health, Osteoporosis, Osteoarthritis, Siddha, Herbs

Introduction

Bone health largely depends on bone mineral content, density, and bone architecture. Healthy bone formation is achieved by the balance between the regulatory actions of osteoblasts and osteoclasts. [1]The prevalence of osteoporosis in women over the age of 50 years in India is estimated to be 20%. Low calcium intake along with a high incidence of vitamin D insufficiency, rising longevity, sex disparity, early menopause, genetic susceptibility, a lack of diagnostic facilities, and a lack of education about bone health have all contributed to the high prevalence of osteoporosis. Calcium, vitamin D, and bisphosphonates are the most often utilised first-line medicines in Indian women. [2]

But the adverse effects like burning sensation and gastrointestinal tract disturbances associated with these conventional therapies limit their use. Various traditional herbs have shown demonstrable benefits in stimulating bone health and few of them are listed below. Thus the protective effects by traditional herbs in multifactorial dysmetabolic disease mainly in bone health could be a better option to overcome side effects of conventional therapy. [1]

Tri-Humoural Theory

Role of *Vatham* in Bone health

According to the Siddha system of medicine, increase in *Vatham* of the Trihumoural theory leads to bone disorders. Rise in *vatham* ultimately affects *Kabam (Sandhigam)* which is present in joints. Increase in *vatham* leads to dryness thereby further alleviating the lubricant characteristics of *Kabam* present in the joints. Loss of lubrication results in firmness and compression in the affected area.

Inflammatory bone disorders occur due to the increase in *Pitham* causing increased dryness and heat in the affected area.[3]

Scientific Validation Of Selected Herbs For Bone Health

1. Tinospora cordifolia

It has immunomodulatory, anti-diabetic, anti-oxidant, anti-inflammatory, anti-pyretic, antispasmodic, hepato-protective, memory-boosting properties. Anticomplement and Immuno-stimulating activities are found inTC-1 (clerodane furano diterpene glycoside), TC-2 (cordioside), TC-4 (syringin), TC-5 (cordifolioside A), TC, i5 (cordifolioside B) and TC-7 (cordiol) isolated from TC. [4]

T. cordifolia is profoundly used in the preparation of several anti-inflammatory medicines and it is recommended for the healing of fractures and inflammatory bone diseases in Indian

ethnomedicine. [5]*Tinospora cordifolia* act as an anti-osteoporotic agent affecting the proliferation, differentiation and mineralization of bone like matrix on osteoblast model systems in vitro. Alcoholic extract of *Tinospora cordifolia* have been shown to stimulate the growth of osteoblasts, increasing the differentiation of cells into osteoblastic lineage and also increasing the mineralization of bone like matrix. The extract have been reported to induce a significant increase in the thickness of joint cartilage, induce the osteogenic differentiation in mouse mesenchymal stem cells and to relieve osteoporosis. [6]

2. Cedrus deodara

Cedrus deodara contains sesquiterpene i.e., α- himachalene, β-himachalene, himachalol, allohimachalol, himadarol, isocentdarol and centdarol. Cedeodarin, dihydromyricetin, cedrin & cedrinoside are also isolated from cedar wood. Anti bacterial, antifungal, insecticidal, mollusicidal, antitubercular, anxiolytic, anticonvulsant, antioxidant, antidiabetic, antiinflammatory, anti arthritis, antispasmodic, woundhealing, immunomodulatory, antimalarial activities are present in this plant. [7]

Mast cells and leukotrienes have been implicated in the pathogenesis of allergic and inflammatory disorders like bronchitis and rheumatoid arthritis. The anti-inflammatory activity of *C. deodara* wood oil is attributed to its mast cell stabilzing activity leading to inhibition of the release of inflammatory mediators from mast cells especially leukotrienes. *C.deodara*·show significant inhibition of enzyme lipoxydase, indicating its ability to inhibit the synthesis of leukotrienes. [8]

Petroleum ether, chloroform and alcoholic extracts of the heart wood of *Cedrus deodara* exhibits external anti arthritic activity by significant inhibition of CFA (Complete Freund's Adjuvant) induced rat paw edema. C. deodara effectively Inhibition of the polyarthritis and acute phase of CFA induced response confirming its activity against the acute and chronic inflammatory response [9]

3. Cissus quadrangularis

Cissus quadrangularis Linn. has potent fracture healing property and antimicrobial, antiulcer, antioxidative, antiosteoporotic, gastroprotective, cholinergic activity as well as beneficial effects on cardiovascular diseases. Ascorbic acid, triterpene, β-sitosterol, ketosteroid, two asymmetrical tetracyclic triterpenoids and calcium were identified as major constituents of this plant. [10]

A phytogenic steroid act on estrogenic receptors of the bone is believed to be the main constituent in *Cissus quadrangularis* influencing early regeneration and quick mineralization of the callus. Fracture healing property on *C.quadrangularis* acts by stimulation of metabolism and increased uptake of the minerals calcium, sulfur and strontium by the osteoblasts in fracture healing. It's antiosteoporotic activity is attributed to the steroids present which act as phyto-estrogens to effectively prevent or reduce bone loss. [11]

4. Ormocarpum sennoides

Qualitative assessment of *Ormocarpum sennoides* for phytochemical analysis revealed the presence of Alkaloids, Betacyanin, Coumarins, Flavanoids, Phenol, Saponins, tannins and terpenoids. These bioactive compounds may be the reason for the free radical scavenging activity of the extract. The plant also contains Antioxidant, Osteogenic, anti-inflammatory and anti-arthritic properties. [12]

In vivo anti-arthritic activity of *Ormocarpum sennoides* showed inhibition of denaturation of bovine serum albumin. This extract showed membrane stabilizing potential by increase in percentage inhibition.

The anti-inflammatory activity of Os extract could be due to inhibition of phospholipase A2 activity or even blocking cyclooxygenase required for eicosanoids synthesis thereby reduces the production of prostaglandins from arachidonic acids. These effects may be due to the presence of bioactive compounds like saponins, alkaloids, and flavonoids present in the Os extract. [13]

5. Ficus benghalensis

Bark contains tannins, wax, esters and glucoside, 20-tetratriaconthene-2-one, 6-heptatriacontene-10-one, pentatriacontan-5-one, beta sitostirol-alpha-D-glucose and meso-inositol. Two flavonoid compounds, viz. 5,7-dimethylether of leucopelargonidin 3-0-alpha-L-rhamnoside and 5,3-dimethyl ether of leucocyanidin 3-0-alpha-D galactosyl cellobioside were present in this plant.[14]

Analgesic, anti-rheumatic, anti-arthritic, antileprotic, antiinflammatory, anti-spasmodic, laxative, antioxidant, immunomodulatory, anti-inflammatory activity of ethanolic bark extract have been reported in *Ficus benghalensis*. The Aqueous extract of *Ficus benghalensis* inhibits the release of lysosomal content of neutrophils at the site of inflammation. Anti-arthritic activity of *F.benghalensis* is effective in inhibiting protein denaturation identified as a cause of inflammation. [15]

Conclusion

Ingested compounds not usually categorized as nutrients may also impact bone health. Unraveling the interaction between different factors such as nutritional, environmental, life style, and heredity help to understand the complexity of the development of osteoporosis and subsequent fractures. Adverse effects during the conventional treatment led to the discovery of traditional and alternative medicines. Few traditional herbs accelerating the process of bone healing and exhibiting beneficial effects on the skeleton have been reviewed.

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