

# **Yoga and Musculoskeletal System - Yoga as an Alternative Therapy for Osteoporosis**

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## **Introduction**

Musculoskeletal system is one of the most important systems in our body, without it, we won't be able to move about gracefully with stride but being a pile of flesh rolling on the ground. Our skeleton holds up and protects our delicate internal organs and spinal cord with its strong framework, and it is connected by muscles to allow us to move in synchronization.

Although without nervous system, we are not able to lift any bones or muscles of this sturdy framework, but I would like to confine this exploratory note to bones and joints of the musculoskeletal system, and the benefit of yoga being the preventive and alternate healing therapy of these ailments.

## **Functions of Skeleton, Bone and Bone Tissues**

The skeleton of a complete body framework consists of 206 bones, and it can be divided into two main groups – the axial skeleton and the appendicular skeleton. The Axial skeleton is the body framework of the head and trunk which consists of 80 bones; the appendicular skeleton includes the four extremities, shoulder and hips which adds up to 126 bones. These bones work with muscles and supportive connective tissue to produce movement at the joints. Besides proving support to our body, bones are very much an organ with a complicated system of blood vessels, lymphatic vessels and nerves. It also served as the storeroom for calcium and produce red blood cell for our body.

There are two kinds of marrow that are found in the bone – Red marrow and Yellow marrow. Red bone marrow manufactures blood cells and is found at the ends of the long bones and at the center of other bones. Yellow marrow composed of fat and is found mainly in the central cavities of the long bones.

Bones consists of two membranes – Periosteum and Endosteum. Both membranes are responsible in bone formation during growth and during time of fracture. Periosteum is found on the outer surface of the bone and it has blood vessels and lymphatic vessels that run through it, these blood vessels and lymphatic vessels helps to nourish bone tissues and keeps it healthy and sturdy. Endosteum lines the marrow cavity of the bone.

Bones are ossificated during the second and third month of embryonic life; at this stage, osteoblasts (a bone building cell) becomes active and manufactures matrix (the

material located between cells) which has large quantity of collagen that gives strength and resilience to the bone tissue; with the help of enzymes, calcium are deposited within the matrix and becomes osteocytes once they are hardened. Osteocytes are living cells in healthy bones though they do not produce new bone tissues. The formation and resorption of bone tissues are regulated by several hormones, osteoclasts and vitamin D.

As bones are subjected to wear and tear, the processes of bone resorption and bone formation continue throughout our lifetime. Bones of young children are more pliable as it contains more cartilage and are undergoing active bone formation. This process of bone resorption and formation tend to slow down as we age, in addition with the slowdown of bone metabolism, bones of the elderly are weaker and more fragile, and more difficult to heal during a fracture.

### **Disorder of the bone – Osteoporosis**

Osteoporosis is a systemic skeletal disorder which there is a decreased of bone mass and deterioration of bony microarchitecture, and the change in the amount and variety of non-collagenous proteins in bone.<sup>i</sup> According to the International Osteoporosis Foundation, osteoporosis affects approximately 1 in 3 women and 1 in 8 men worldwide,<sup>ii</sup> and it significantly affects life expectancy and life quality of sufferers with their fragile bony framework. The most common areas of fracture are lumbar vertebrae, hip and wrist.

We can classify the cause of osteoporosis into three groups: a) due to Postmenopausal; b) due to Senile; and c) due to medication.

- a) Postmenopausal Osteoporosis is the most common cause of osteoporosis due to hormonal change in women, or even men, with a deficiency of estrogen or testosterone. Estrogen deficiency slows down bone formation and causes an increase in bone resorption, and it also cause the bone to become more sensitive to parathyroid hormone which lead to an increase in calcium release from bone.
  
- b) Senile Osteoporosis, occurs in women and men due to a decrease in bone formation. The consequence is the loss of cortical and trabecular bone, and increased risk of the fracture of hip, long bones and vertebrae column.
  
- c) Steroid or Glucocorticoid – induced Osteoporosis is caused by the long term usage of steroid and glucocorticoid. Glucocorticoid excess will induce secondary osteoporosis as it diminish calcium absorption and increase renal calcium excretion.

Other factors that might be the cause of osteoporosis includes smoking, heavy alcohol consumption, eating disorders, low body weight, low calcium diet, prolong immobilization such as stroke, early menopause, absence of menstrual periods, bone cancer or strenuous exercises.

### Symptoms of Osteoporosis

There are no symptoms in the early stages of the disease, and symptoms only manifest at the later stage when sufferer fracture a bone at the vertebrae column, wrists or hips. They might suffered from lower back pain, neck pain, bone pain or tenderness, loss of height over time and have a stooped posture.

### Western medication for treating and prevention of Osteoporosis

The treatment of osteoporosis in western medication concentrates on reducing the degree of bone degeneration, minimize risk factor of fall to prevent fracture and reduce pain associated with the disease. There are various kinds of drugs that are used to treat osteoporosis; each varies in their side effect, benefits and costs which are tabulated below:

Drug	Bisphosphonates	Raloxifene	Hormone Replacement	Calcitonin
<b>Subcategories of drug</b>	Alendronate (Fosamax); Risedronate (Actonel).	Evista (Similar to the breast cancer drug tamoxifen)	Hormonal drug	Miacalcin (Nasal spray); Calcimar (injectable)
<b>Benefits</b>	It prevents bone loss the reduce the risk of spinal and hip fractures	Reduce the risk of hip fracture by 50%.	Preventive against bone loss due to hormonal change	To slow down the degeneration of bone and relives bone pain.
<b>Side Effect</b>	Stomach upset; irritation of the esophagus;	Risk of blood clots in the leg veins or in the lungs	Heart attack, strokes, blood clots, breast cancer	Nasal irritation from the spray and nausea from the injectable form;

### Yoga as an alternative therapy for Osteoporosis

Although western medication has both positive and negative effects in its treatment and preventive measures for osteoporosis, it is unethical of me to suggest osteoporosis sufferers to adopt yoga therapy as the single mode of healing. Yoga teaches balance - balancing of mind, body and spirit, it is thus important for osteoporosis sufferers to implement a healing program that they can stick to in a long run. Yoga “might not be able to replace bones that are already lost, but it can help maintain strength in bones. Simple stretching can bring softness and agility to the joints. Agility helps us maintain balance to prevent falling as we age.”<sup>iii</sup>

The major concern of osteoporosis is the loss of bone density that leads to the fragility of bones, especially the lumbar vertebrae, hips and wrists but not exclusive. Women after 50 years of age postmenopausal are more susceptible to the disease, whom have to address emotional and physical transitions due to hormonal changes at the same time.

My therapeutic program for such group of sufferers will has the following approach:

- 1) Strengthening of muscles around the back, hips and extremities to provide better support for the bones in these areas to minimize the risk of fracture;
- 2) Strengthening of bone and increase flexibility of joints through weight bearing and stretching;
- 3) Pranayama and mediation to restore emotional calmness and balance;

## Yoga Therapy Program for Osteoporosis

Asana/ Pranayama		Objective / Area at work
Abdominal breathing		To provide lung and diaphragm workout; oxygenate the blood; strength trunk muscles and calm the mind.
Single nostril breathing/ Alternate nostril breathing		To provide lung and diaphragm workout; balance our body and calm the mind.
Surya Namaska		To give the body and spine an overall workout.
Tadasana		To strength muscles of whole body and to correct stoop posture to promote better blood circulation.
Tadasana Urdhve Hastasana		To strength back, trunk and arms muscles; to expand shoulder and chest.
Trikonasana		To provide a lateral twist for the spine; strengthen extremities and hip joints.
Adhomukha Savansana		Strengthening and lengthening of spine and extremities; Weight bearing for extremities to strengthen bones.
Bhujagasana		Strengthening of arms and upper back muscles, weight bearing on wrist; open up shoulder, massage the pelvis region.
Danurasana		Strength back muscles and four extremities.
Cat and Cow		Weight barring on four extremities; work on spine flexibility.
Dandasana		Correct posture, shoulder opener; strengthen and lengthening of spine and trunk.
Marichyasana		Provide lateral spinal twist to promote flexibility.
Paschimottanasan		Work on hamstring and massage internal organs;
Supta Banda Konasana		To open hip joints and calm the mind.
Savasana		To relax and calm the mind.
Meditation		To relax and calm the mind.

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- <sup>i</sup> <http://www.emedicine.com/MED/topic1693.htm#section~introduction>  
<http://en.wikipedia.org/wiki/Osteoporosis>
- <sup>ii</sup> <http://www.emedicine.com/MED/topic1693.htm#section~introduction>
- <sup>iii</sup> <http://www.yogajournal.com/practice/943>