# Yoga and Musculoskeletal System

Musculoskeletal system is an organ system that gives humans the ability to move using their muscular and skeletal systems. It is made up of the bones of the skeleton, muscles, cartilage, tendons, ligaments, joints, and other connective tissue that supports and binds tissues and organs together. Bones are the most hard and tough part of the body. It remains for so many hundreds of years after death. Though they are hard, they are not so heavy. Bone contains of water. Remaining solid part mostly made up of calcium phosphate. This gives hardness to bone. Due to hardness, they can bear pressure during posture and movements. Bone stores 99% of body calcium and 85% of phosphorus. Bone is the reservoir of these minerals. (Calcium bank account).If necessary we can move bone calcium to the other purpose.

Calcium is very important in function of muscles and nerves, so we have to maintain the proper blood level of it. It is important to built strong and healthy bones in the childhood and teen years to avoid osteoporosis and other bone problems in later life. In growing age, the daily need is 1300mg calcium i.e. 3 cups of fat free milk. Other milk products, green leafy vegetables, broccoli, spinach, tofu, cereals are the reach sources of calcium. Daily nutrition and regular exercise are two important factors to maintain the health of bone for a long time.

Our long bones contain cavity where the bone marrow is situated. It is the factory for the formation of blood cells. Bone produces specific structure for the body. Young healthy person and old weak person can be easily differentiated just seeing the structure externally, where we can easily recognize, what health of bone

is and what the degeneration of bone is. In the patients of rickets, we can see the poor shape of the chest.

In childhood, the bones are somehow elastic (Called as- green stick). It contains comparatively more protein. Protein gives elasticity. As age progress calcium percentage gets increased.

Along with muscles, bones are very important in making specific posture or any movement. Besides that, the bones protect vital organs. (eg- thoracic cage protects heart, lung…Skull protects brain…spine protects spinal cord…pelvis protects urogenital organs etc.). The ribs help in respiration. Small bones of ears help in hearing.

Adult person have 206 bones, most of which are arranged symmetrically. According to size and shape they are divided as – long, short, flat, irregular bones. Microscopically any bony tissue contains 3 parts-

1. Bone cell- Osteoclast, Osteoblast, osteocytes.
2. Bone matrix- collagen fibers.
3. Minerals.

Our bone has high potential of the repair and regeneration. In young age, fractured bones get repaired within 4 to 6 weeks.

**Hormones and health of bones-**

Oestrogen- It helps to assimilate calcium in the bones. It is said to be a female hormone, secreted by ovaries. After menopause, since the ovary starts degeneration, the estrogens deficiency occurs which leads to loss of bone mass- osteoporosis. Females are 4 times more likely than male to develop osteoporosis. Hormonal replacement therapy along with nutrition helps to control the disease.

Regular gentle exercise like asana, aerobics are helpful to avoid the osteoporosis. If the female continues the practice in young and middle age, the menopause becomes physiological. (Already store enough calcium in the bone bank!!). Regular pranayama practice helps to maintain the hormonal levels normal (especially anabolic). Also it controls the oxidative stress which increases the possibilities of early degenerations.

Oestrogen is also helpful in male for the bone health.

Testosterone- This is useful to keep the size and thickness of the bones. To some extent, it is useful to assimilate calcium in the bones.

Parathyroid hormone- It maintains the blood level of calcium. When blood level decreases, it reabsorbs ca from bones and also inhibits the filtration of Ca from urine.

**Bone – Ageing process**

The most common group to experience musculoskeletal and joint disorders is people over 50 years old. Because of their association with aging, musculoskeletal disorders are likely to become more prevalent as the world's population ages. Chronic pain is the most common problem and most common reason for seeking medical care in musculoskeletal disorders.

There are two principal effects of ageing in bone tissue- loss of bone mass and brittleness. Loss of bone mass results from demineralization. (ca, phosphate, etc.). In weak female it may start after 30. After hysterectomy in the

middle age, the ageing starts. Once bone loss begins in females, about 8% of bone mass is lost per year. In male, once the loss begins, about 3% of bone mass is lost per year. Loss of bone mass also leads to deformity, pain, loss of height and loss of teeth.

The second principal effect is brittleness, because decreased protein synthesis (decreased collagen formation).Such bone is much prone for fractures (fractures due to small injury).

## Joints-

Communication in between two or more bones is a joint. The specific structure of the particular joint determines the specific movements of the joint.

Ligaments and muscles hold the alignment of joints in posture and movements. Especially, ligaments said to be binders and muscles said to be movers. In big joints, ligaments form a capsule so that some fluid remains in the cavity. (Synovial fluid) This acts as a lubricant and shock absorber during friction in movements and posture. The surface of bones which come in contact with other is covered by cartilage.

## Ligaments-

These are fibrous, slightly stretchy connective tissue, made up of collagen fibers. These control the range of motion of joints. Stretching exercise and hold the final state of any asana increase the length and flexibility of muscles.

If ligaments are over-stretched either by injury, excessive strain on joint or by improper stretching (jerky stretch in sports), the joint become weaker, because, the elongated ligament cannot support joint properly.

Overstretching asana should be done gently, slowly. If you are not reaching to the final state, let it should be up to limit. Unbearable pain, discomfort denotes that the stretching is beyond limit.

Secondly, the stretching time should be limited. Stretch for prolonged time also weakens the ligament. Meditative asana for a prolonged time may create such problem. Especially, when muscles are stiff (not properly stretching) the person adopts the final state by giving much more strain on the joints which make injury to ligaments.

## Cartilage-

It's a thick, elastic but less hard tissue than bone. It destroy after death. Regarding the joints, it's either a thick layer of the articulating surface of the joint or as a pad in between two articular surface (meniscus). Or it may combine with fibrous tissue and become the part of joint (fibro-cartilage- pubic symphysis)

Basically cartilage is a shock absorber. Because of healthy cartilage , one can bear the pressure during postures or movements. Sometimes even the muscles are elastic but due to weak cartilage , one cannot achieve the final stage of asana as the pain get created due to small pressure or sometimes one can achieve the final stage but can not maintain it for a long time due to pain. Cartilage injury determines the severity of arthritis. Complete loss of cartilage makes the fusion of bone which restricts all movements.

**"Double joint condition."**

Double jointed person does not really have extra joints. The person has greater flexibility in their articular capsules and other ligaments (hyperlaxity- more

elasticity than usual). This result in the increase in the range of motion- touching the thumb.

Unfortunately, such flexible joints are less structurally stable and are more easily dislocated. In young age they get fame but after 35 years, most of them suffer from injuries.

## Yogic Practices on Musculo-skeletal system

- **Sun salutation- (Suryanamaskara )- and Bone health**

It's a sequence of 12 postures along with chants in sunlight. Now a day, people perform it fast, as a physical exercise. Actually it should be done slowly and that too in the early morning sunlight. (not inside AC rooms or too hot rooms) because while performing in sunlight, the microcirculation get improved. The circulation towards bone cells, bone marrow, joint structures (cartilages, ligaments)get improved. Also it activates and warm ups most of the important muscles. About 90 to 95% muscles switched on to active mode.

Early morning sunlight stimulates the formation of Vitamin D (essential for the bone growth) under the skin. For that one has to stay in that posture at least for 30 sec. So in Suryanamaskara one has to maintain the posture for 30 sec. Thus one cycle of salutation completes in 6 minutes. Because of variety of postures, all parts of body come in contact with sunlight. In this way, the practice helps to improve bone growth.

- **Balancing asana and bone health-**

Especially, in standing asana, much pressure comes on various joints like- ankle, knee, hip, low back. Also the asana which lifts body on shoulder produces much pressure on the joints of upper extremities.

Do not begin too early and too late in the life. In early childhood, slowly slowly grow up in these asana. If you are performing regularly in youth then, also in old age you can perform. But if you begin at old age, at least firstly confirm the bone density and muscle health. Especially in the females, after 50, one should take care about the asana according to bone density.

- **Breathing Manipulation ( Pranayamas and Kapalbhati)**

In YOGA however, the oxygen demand of the body is met through the the union of the breath with the hold or transition of the asana. The oxygen supply can simply keep pace as the respiratory system is engaged & working with the body to promote the cellular conversion which is happening within the skeletal muscles of the body.

Some muscles of the body are frankly forgotten about. The design of the practice has proven that all the muscles of the body are activated & in many cases 're-found'. Modern lifestyles are changing the way we use our body on a daily basis, & because of our tendency to sit for ling durations of time the muscles of our ribs & stomach especially are becoming utrophy, hindering the breath & causing strain to our internal organs. While the practice utalises the full body, learning how to breath correctly again is really one of the true gifts of the practice.

- **Relaxed Muscular Tone**

Even in sleep we are rarely in a state of complete rest as we always tend to hold a certain degree of tension in the body. This is known scientifically as basal tension or muscular tone & is a vital requirement in the configuration & posture of our body. Even when we are not moving, this maintenance of the body uses up our energy.

- **Conclusions:**

Our skeleton system is constantly working to preserve our framework not only externally but also internally. Yoga helps in realignment of various mechanical disorders like knee pain, neck pain, cervical spondylosis, lower backache, slipped disc, hiatus hernia, umbilical hernia, arthritis, including osteoarthritis, rheumatoid arthritis and gout etc. In order to counter various medical problems, there are various yoga positions and postures which can be practised to free our joints and relieve pressure on the cartilage. These Asanas can be done sitting, standing, lying down, and upside down. Before attempting these, it is essential to learn how to stand erect. Some people stand with knees bent, others protrude the abdomen, while some throw the weight of the body on one foot or the other or have the feet at an angle. This can be noticed by watching where the soles & heels of the shoes wear out. All these standing defects tell upon the spinal column which in turn affects the mind.