

Bone Related Disease and Their Treatment Case Study In Ayurvedic

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ABSTRACT:-

The human skeletal system becomes brittle, due to loss of bone density, which can lead to fractures and a compressed spinal column, thereby affecting posture and resulting pain in the back and the spine with increasing age. With alarming conditions, it affects other functions and organs in the body, causing associated symptoms of, causing associated symptoms of osteoporosis, constipation, degenerative arthritis, low back pain, insomnia, bladder and kidney weakness, frequent urination and dental problems.

The incidences are more prevalent in older women. Ayurveda considers this deficiency disorder to be dominated by the air humour of vata

I. INTRODUCTION:-

Ayurveda recommends the improvement in bone density through wholesome nutrition, herbs, healthy, activities, and with some good home therapies, without depending on drugs or hormones.. In fact, osteoporosis is considered to occur contributing to menopausal disorders in women due to the same causes as impairment of vata dosha.

The Ashoka bark possess potassium, iron, magnesium, sodium, silica, phosphate and calcium, is also considered good for improving bone density and alleviating uterine disorders in menopausal women

Human bone disease is an acute or chronic human disease among large human populations Bone fracture , osteoporosis bone cancers, bone metastasis and many others are frequently occurred

in the clinic.. To reduce pains and chronic symptoms, different drugs and therapeutic options have been widely utilized in the clinic. However, these types of bone-disease therapeutics need experienced doctors to practice. A lot of young and remote doctors cannot effectively choose different therapeutics. In order to improve

Ayurveda recommends the improvement in bone density through wholesome nutrition, herbs, healthy activities, and with some good home therapies, without depending on drugs or hormones. In fact, osteoporosis is considered to occur contributing to menopausal disorders in women due to the same causes as impairment of vata dosha.

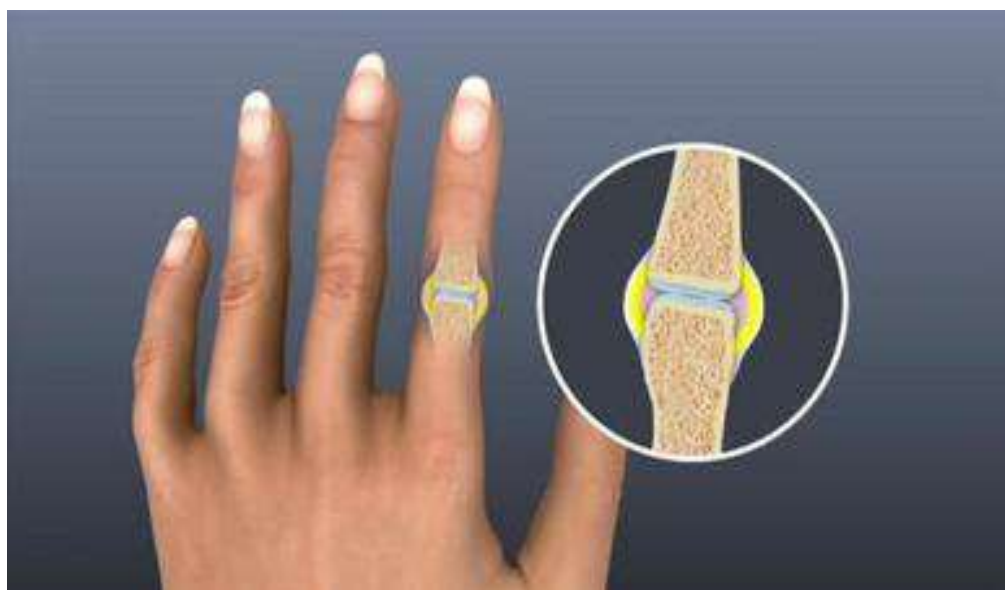
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Types Of Bones Related Disease:-

- 1) Rheumatoid Arthritis disease
- 2) Rickets Disease
- 3) Osteoporosis Disease
- 4) Osteomalacia Disease
- 5) Paget's Disease
- 6) Frozen Shoulder Disease
- 7) Clavicle Fracture Disease
- 8) Trigger Finger Disease
- 9) Felty Syndrome Disease



Rheumatoid arthritis (RA):-



Definition:

Is an autoimmune disease in which the body's immune system – which normally protects its health by attacking foreign substances like bacteria and viruses – mistakenly attacks the joints. This creates inflammation that causes the tissue that lines the inside of joints (the synovium) to thicken, resulting in swelling and pain in and around the joints.

Causes:-

The Rheumatoid arthritis occurs when your immune system attacks the synovium the lining of the membranes that surround your joints.

The resulting inflammation thickens the synovium, which can eventually destroy the cartilage and bone within the joint.

The tendons and ligaments that hold the joint together weaken and stretch. Gradually, the a genetic component appears likely.

While your genes don't actually cause rheumatoid arthritis, they can make you more susceptible to environmental factors such as infection with certain viruses and bacteria that may trigger the disease.

Symptoms:-

While early symptoms of rheumatoid arthritis can actually be mimicked by other diseases, the symptoms are very characteristic of rheumatoid disease. Rheumatoid arthritis symptoms and signs include the following:

- Fatigue
- Joint pain
- Joint tenderness
- Joint swelling

- Joint redness
- Joint warmth
- Joint stiffness
- Loss of joint range of motion
- Limping
- Joint deformity
- Many joints affected (polyarthritis)
- Both sides of the body affected (symmetric)
- Loss of joint function
- Anemia
- Fever

Treatment and medications:-

Treatment for rheumatoid arthritis is aimed at reducing inflammation to the joints, relieving pain, minimizing any disability caused by pain, joint damage or deformity, and either slowing down or preventing damage to the joints. There is no current cure for rheumatoid arthritis.

With the help of an occupational therapist and physical therapist (UK: physiotherapist) patients can learn how to protect their joints. Depending on the degree of damage to the joints, surgery may sometimes be needed.

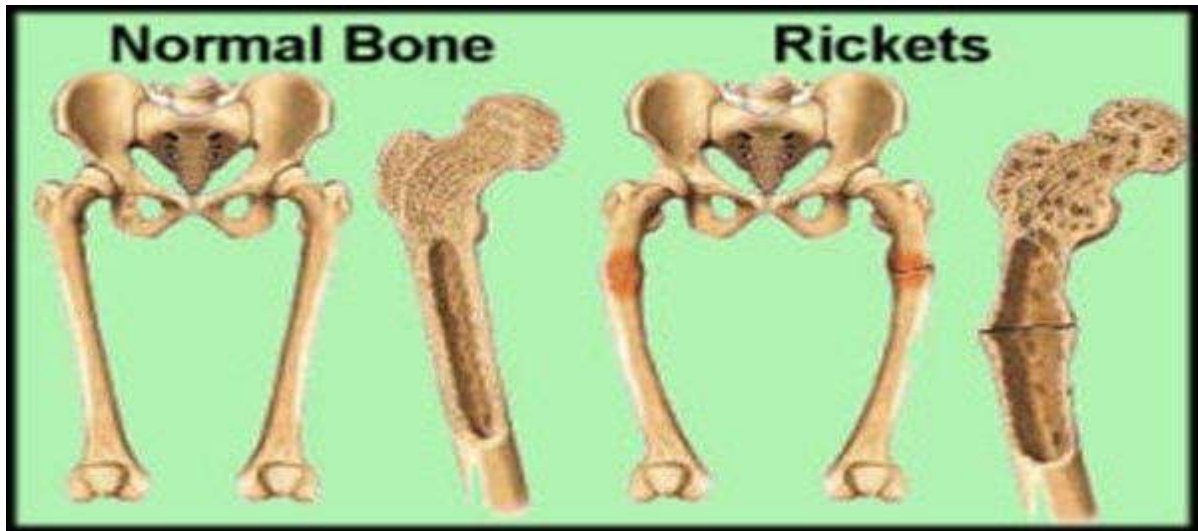
If the patient has had inflamed joints for over six weeks the GP (general practitioner, primary care physician) will most likely refer him/her to a rheumatologist (an arthritis specialist doctor), so that diagnosis can be confirmed and treatment started as soon as possible.

❖ Rickets:-

Definition: Rickets is a bone disorder caused by a deficiency of vitamin D, calcium, or phosphate. Rickets leads to softening and weakening of the

bones and is seen most commonly in children 6-24 months of age. Vitamin D promotes the absorption of calcium and phosphorus from the gastrointestinal tract. A deficiency of vitamin D

makes it difficult to maintain proper calcium and phosphorus levels in bones, which can cause rickets.



Causes:

Occur if your child's body doesn't get enough vitamin D or if his or her body has problems using vitamin D properly. Occasionally, not getting enough calcium or lack of calcium and vitamin D can cause rickets. Lack of vitamin D Children who don't get enough vitamin D from these two sources can develop a deficiency: Your skin produces vitamin D when it's exposed to sunlight. But children in developed countries tend to spend less time outdoors. They're also more likely to use sunscreen, which blocks the rays that trigger the skin's production of vitamin D.

Fish oils, fatty fish and egg yolks contain vitamin D. Vitamin D also has been added to some foods, such as milk, cereal and some fruit juices.

Symptoms:

Signs and symptoms of rickets may include the following:

- Baby is 'floppy.'
- Bone pain.
- Bone tenderness.
- Bones break easily.
- Costochondral swelling – prominent knobs on the bone between the ribs and the breast plate.
- Harrison's groove – a horizontal line visible on the chest, where the diaphragm attaches to the ribs.

- Low calcium blood levels (hypocalcemia).
- Older children may have knock knees (genu valgum).
- Soft skull (craniotabes).
- Low physical growth (height and weight) may be affected.
- There may be spinal, pelvic, or cranial deformities.
- Toddlers may have bowed legs (genu varum).
- Uncontrolled muscle spasms, which may affect the entire body (tetany).
- Widening wrists.
- Symptoms vary in severity and may be intermittent.

Treatment and medications:

Simply, treatment focuses on increasing the patient's intake of calcium, phosphates, and vitamin D. This may involve exposure to sunlight, consuming fish oils, and ergocalciferol or cholecalciferol (forms of Vitamin D).

Exposure to ultraviolet B light and consuming calcium and phosphorus is usually enough to reverse or prevent rickets.

If rickets is caused by bad diet, the patient should be given daily calcium and vitamin D supplements, an annual vitamin D injection, as well as being encouraged to eat vitamin D rich foods.

Treating genetic rickets – the patient will be prescribed phosphorus medications and active

vitamin D hormones.

Other medical conditions – if rickets has an underlying medical cause, such as kidney disease, that disease needs to be treated and controlled.

❖ **Osteoporosis:-**

Definition:

Osteoporosis is a condition characterized by a decrease in the density of bone, decreasing its strength and resulting in fragile bones. Osteoporosis literally leads to abnormally porous bone that is compressible, like a sponge. This disorder of the skeleton weakens the bone and results in frequent fractures (breaks) in the bones.

Normal bone is composed of protein, collagen, and calcium, all of which give bone its strength. Bones that are affected by osteoporosis can break (fracture) with relatively minor injury that normally would not cause a bone to fracture. The fracture can be either in the form of cracking (as in a hip fracture) or collapsing (as in a compression fracture of the vertebrae of the spine). The spine, hips, ribs,

and wrists are common areas of bone fractures from osteoporosis although osteoporosis-related fractures can occur in almost any skeletal bone

□ Inherited disorders of connective tissue, including osteogenesis imperfecta, homocystinuria, osteoporosis-pseudoglioma syndrome and skin diseases, such as Marfan

□ syndrome and Ehlers-Danlos syndrome

Vitamin D deficiency: Amenorrhea (loss of the menstrual period) in young women is associated with low estrogen and osteoporosis; amenorrhea can occur in women who undergo extremely vigorous exercise training and in women with very low body fat (for example, women with anorexia nervosa)

Symptoms of Osteoporosis:

There typically are no symptoms in the early stages of bone loss. But once your bones have been weakened by osteoporosis, you may have signs and symptoms that include:



- Back pain, caused by a fractured or collapsed vertebra
- Loss of height over time
- A stooped posture
- A bone fracture that occurs much more easily than expected
- Difficulty getting up from a chair without using your arms to push
- Joint or muscle aches

Treatment and Medications for Osteoporosis:

For both men and women at increased risk of fracture, the most widely prescribed osteoporosis medications are bisphosphonates.

Examples include:

- Alendronate (Fosamax)
- Risedronate (Actonel, Atelvia)
- Ibandronate (Boniva)

□ Zoledronic acid (Reclast)

□ Hormone-related therapy: Raloxifene (Evista) mimics estrogen's beneficial effects on bone density in postmenopausal women, without some of the risks associated with estrogen.

□ Denosumab (Prolia): Compared with bisphosphonates, denosumab produces similar or better bone density results and reduces the chance of all types of fractures. Denosumab is delivered via a shot under the skin every six months.

□ Teriparatide (Forteo): This powerful drug is similar to parathyroid hormone and stimulates new bone growth. It's given by daily injection under the skin.

❖ **Osteomalacia:-**

Definition: means soft bones. Bone is a living, active tissue that's continually being removed and replaced. This process is known as bone turnover. Bone consists of a hard outer shell (the cortex) made up of minerals, mainly calcium and phosphorus, and a softer inner mesh (the matrix) made up of collagen fibres.

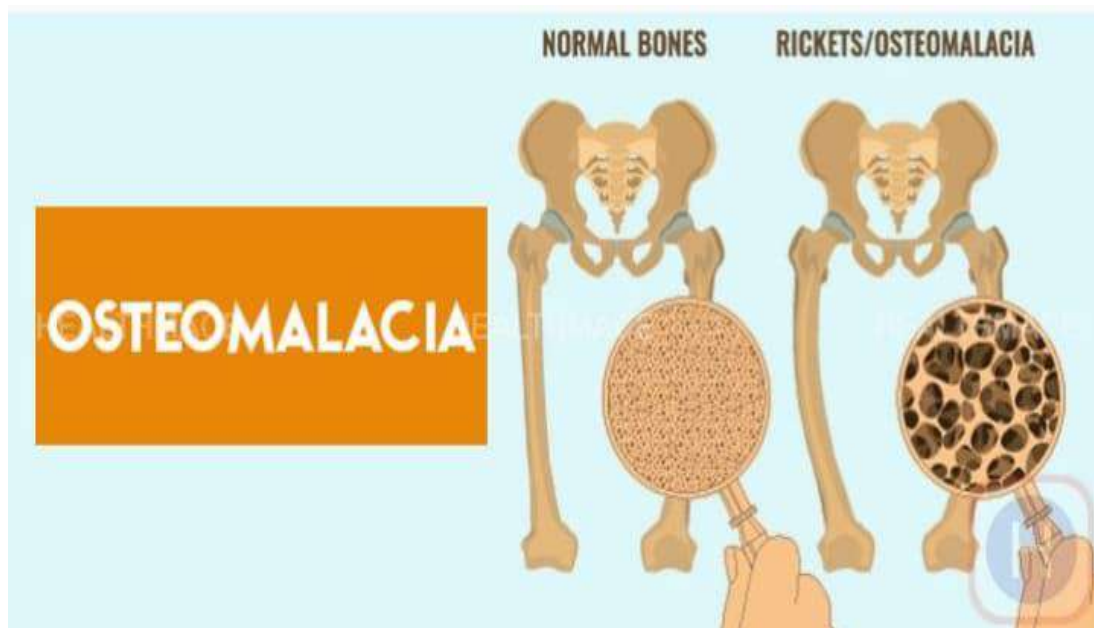
When normal bone is formed, these fibres are coated with mineral. This process is called mineralisation. The strength of the new bone depends on the amount of mineral covering the collagen matrix. The more mineral laid down, the stronger the bone. Osteomalacia happens if mineralisation doesn't take place properly. In osteomalacia more and more bone is made up of

collagen matrix without a mineral covering, so the bones become soft. Thes...

Causes:

A lack of the proper amount of calcium leads to weak and soft bones. Vitamin D is absorbed from food or produced by the skin when exposed to sunlight. Lack of vitamin D produced by the skin may occur in people who:

- Live in climates with little exposure to sunlight
- Must stay indoors
- Work indoors during the daylight hours
- Wear clothes that cover most of their skin
- Have dark skin pigmentation
- Use very strong sunscreen



You may not get enough vitamin D from your diet if you:

Symptoms of Osteomalacia:

The symptoms of osteomalacia include the following.

Bones that fracture very easily are the most common symptom. Another symptom is muscle weakness. This happens because of problems at the location where the muscle attaches to bone. You may have a hard time walking and may develop a waddling gait. Bone pain, especially in your hips, is also a very common symptom.

This dull, aching pain can spread from your hips to your lower back, pelvis, legs, and even your ribs. If you also have very low levels of calcium in your blood, you may have:

- Irregular heart rhythms
- Numbness around your mouth

- Numbness in your arms and legs
- Spasms in your hands and feet

Treatment used for Osteomalacia:

Treatment will cure osteomalacia in most cases, but easing bone pain and muscle weakness may take several months.

If the disease is caused by a lack of vitamin D, daily doses of 20–50µg/800- 2,000 units vitamin D are often used, but some doctors may give larger doses to start off with.

Calcium supplements of 500–1,000 milligrams (mg) a day may speed up bone healing if your calcium intake from your normal diet is below 750 mg a day. Self-help and daily living There are many things people can do to promote healthy bones. These include:

- Having a diet rich in vitamin D
- Getting a healthy amount of sunshine

- Reducing alcohol intake
- Stopping smoking
- Exercising regularly

❖ **Paget's disease:-**

Definition:-

Is also known as osteitis deformans and Paget disease. It is a localized disorder occurs during bone remodeling. In this disease, the normal cycle of bone renewal is disrupted due to the abnormal activity of osteoclast cells. Due to which the extreme resorption of bone by osteoclast cells takes place in the remodeling phase.

As a result, the reconstructed bone has a peculiar structure which is disorganized, soft, more bulky, mechanically weak, more vascularized,

brittle and breaks easily. This complication is susceptible to arthritis, hearing loss, discomfort, and fractures. If a fracture happens to a patient with Paget's disease, it may take a long time to alleviate the fracture, because of the irregularities in the bone renewal functions

causes Paget's disease:-

The causes of Paget's disease are not fully known. But there are some predicted reasons behind this disease are as follows:

Infection of measles virus during childhood. A virus particle called paramyxo virus nucleocapsid was identified inside the bone cells in a few patients, whereas the virus is not found in the normal patient. But this statement is controversial. Partially due to genetic inheritance.. .



Symptoms:-

Usually, people with Paget's disease do not have symptoms until it is known by X- ray images or blood tests. Symptoms do rarely occur as follows.

- Frequent joint pain, hip pain, low back pain and neck pain
- Damage to cartilage of joints
- Enlarged bones
- Broken bones
- Fatigue
- Reduced in height
- Skull
- Hearing loss
- Headaches
- Facial Droop
- Loosened teeth
- Spine
- Leg pain

Treatment Paget's disease:

Paget's disease can be treated with medications and in some instances by surgery.

Medications is used to control bone regeneration

and to prevent the disease from getting worse. Paracetamol, acetaminophen, naproxen, and ibuprofen. Used to counter the pain.

Your physician may prescribe an oral medication:

- Alendronate (Fosamax) or etidronate (Didronel) to be taken orally up to six months.
- Tiludronate (Skelid) to be taken orally every day up to three months.
- Risedronate (Actonel) to be taken orally every day up to two months.
- Injectable medications
- Pamidronate (Aredia). It is injected into the vein once in a month or once every few months.
- Zoledronate (Reclast). It is injected into the vein once a year.
- Surgery may be needed for the following conditions.
- Fracture of the bones is corrected by joining the broken bones together by a stainless steel rod.

❖ **Frozen shoulder:-**



Definition:

Frozen shoulder is also referred to as adhesive capsulitis and is characterized by pain and loss of motion of the shoulder joint. The exact cause of frozen shoulder is unknown, even though it has been found to affect somewhere between two and five percent of people during their lifetime. Diabetes, thyroid disorder, a history of shoulder trauma, and periods of shoulder immobilization have been found to be risk factors that may lead to frozen shoulder. Females are also at higher risk. Occasionally, patients develop frozen shoulder after shoulder surgery or traumatic injury to the shoulder. Research suggests that the process is started with an inflammation of the lining of the joint within the shoulder. Gradually this area thickens and results in the shoulder becomes stiffer and more painful

Causes:

The causes of frozen shoulder are not fully understood. There is no clear connection to arm dominance or occupation. A few factors may put you more at risk of developing frozen shoulder.

Diabetes: Frozen shoulder occurs much more often in people with diabetes. The reason for this is not known. In addition, diabetic patients with frozen shoulder tend to have a greater degree of stiffness that continues for a long time before “thawing.”

Other diseases: Some additional medical problems associated with frozen shoulder include hypothyroidism, hyperthyroidism, Parkinson’s disease, and cardiac disease.

Immobilization: Frozen shoulder can develop after a shoulder has been immobilized for a period of time due to surgery, a fracture, or another injury. Having patients move their shoulders soon after injury or surgery is one measure prescribed to prevent frozen shoulder.

Symptoms:

- Main symptoms of a frozen shoulder are:
- Decreased motion of the shoulder
- Pain
- Stiffness
- Complications

Treatment and medications:

A frozen shoulder will self-resolve in most cases. Treatment will depend on the stage of the condition and the levels of pain experienced. Initial management will focus on maintaining range of movement and strength.

These are suggested exercises only. If you are at all concerned about whether these exercises are suitable for you or if you experience any pain while doing them, please seek appropriate clinical advice from your GP or Physiotherapist.

Using painkillers when needed: Over-the-counter analgesia is available through pharmacies when needed. Paracetamol is most commonly prescribed. Anti-inflammatories, such as Ibuprofen, are also used, but as there is little or no inflammation involved in osteoarthritis these are best avoided without discussing with your GP. Side effects are even more common than with paracetamol so please ensure to take appropriate medical advice. There is a good booklet on the Arthritis Research UK website with information about the various drug options.

❖ **Clavicle Fracture :**



Causes:

An athletic event resulting in a direct hit or fall. Sports-related clavicle fractures are commonly seen in children and young adults. Caution is advised when playing contact sports including football, rugby, and hockey and when participating in “extreme” sports where falls can happen such as biking and skateboarding.

Symptoms:

- A fall on the shoulder or an extended arm
- A direct hit to the shoulder in a motor vehicle collision
- Falling on the shoulder is the usual cause of clavicle fractures
- A broken collarbone most often causes immediate pain in the area of the fracture.
- Some people report hearing a snapping sound.
- Most people tend to hold their arm close to their body and support it with their other hand. This avoids movement of the shoulder which would aggravate the pain. Despite the pain, some people, particularly younger athletes, can have a surprising range of motion of their arms following a broken collarbone.
- The shoulder of the affected side is usually slumped downward and forward due to gravity.

- If the clavicle is gently touched along its length, pain is usually greatest at one point, locating the break. Often a crunching feeling is noted over the break, known as crepitus.
- The skin over the break often bulges outward and can be discolored a reddish-purple, indicating an early bruise.

Treatment:

Many broken collarbones will end up healing on their own. For those who don't need surgery, you can use a sling to prevent your shoulder and arm from moving while the bone is in the healing process one for as long as three to four weeks.

❖ **Trigger finger:-**

Definition: Stenosing tenosynovitis is a condition that involves one of the fingers or thumbs becoming stuck in a bent position and then rapidly straightened like the trigger of a gun. This condition is caused by a narrowing of the sheath that surrounds the tendons in the finger, and is common in people who perform repetitive gripping actions but can occur in anyone. Trigger finger causes stiffness, pain and may eventually lead to an inability to completely straighten the finger. When you try to straighten your finger, it will lock or catch before popping out straight.

Causes:

Trigger finger is caused by inflammation of the tenosynovium. The tenosynovium is the substance that lines the protective sheath around the tendon in

the finger. This substance enables the tendon to glide smoothly within the sheath when the finger is bent or straightened.



When inflammation is present, the tendon is unable to glide smoothly within its sheath causing “catching” of the finger in a bent position and then suddenly releasing the finger straight. Causes of trigger finger can include the following:

Repetitive Motion: Individuals who perform heavy, repetitive hand and wrist movements with prolonged gripping at work or play are believed to be at high risk for developing trigger finger.

Medical Conditions: Conditions associated with developing trigger finger include hypothyroidism, rheumatoid arthritis, diabetes, and certain infections such as TB.

Gender: Trigger finger is more common in females than males.

Symptoms:

The most common symptom of trigger finger is stiffness in the joints of the finger, especially in the morning. Other symptoms may include:

Popping or clicking is felt when moving the finger
Tenderness, sometimes accompanied by a lump in the palm of the hand at the base of the affected finger

Swelling
Finger is locked in a bent position and is unable to straighten
Symptoms are usually worse in the morning and after periods of inactivity.
Maintaining mobility and activity in the fingers will keep them from becoming too stiff. In some cases, more than one finger may be affected.

In children with the congenital form of the

condition, there is often no pain related with the bent finger position and there is generally no history of trauma or continuing use of the joint. In about one fourth of all congenital cases, the condition befalls in both hands.

Diagnosis:

Your doctor will start with a physical exam of your hand and fingers. The finger may be swollen, stiff, and painful. You might have a bump over the joint in the palm of your hand. Or it could be locked in a bent position. There are no X-rays or lab tests to diagnose trigger finger.

Treatment:

- Nonsurgical Treatment
- Initial treatment for a trigger finger is usually nonsurgical.

Rest: Resting your hand and avoiding activities that make it worse may be enough to resolve the problem

❖ Felty syndrome:-

Definition:

Is a condition that includes rheumatoid arthritis, splenomegaly (enlargement of the spleen) and granulocytopenia (decreased level of the certain type of white blood cells). In Felty syndrome, rheumatoid arthritis is seropositive, which means that the rheumatoid factor can be found in the blood. This syndrome is sometimes seen as a complication of rheumatoid arthritis

This syndrome usually includes:

Leukopenia, a low overall white blood cell count

Neutropenia, a low number of neutrophils (a type of white blood cells) Splenomegaly, an enlarged spleen
 Occasionally, a swollen liver

Causes:

There is currently no evidence for the exact cause of FS. However, both genetics and immunosuppressive drugs used to treat previous aggressive and seropositive RA, tend to play a large role in its etiology.

FELTY'S SYNDROME

- **Classic triad: RA, neutropenia, splenomegaly**
- **Risk factors: RF+, nodular RA and +HLADR4**
- **Manifestations:**
 - **Non-healing leg ulcers**
 - **Infections**
 - PMNs < 1000/mm³
 - Common cause of death



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It is thought that genetics and the use of immunosuppressive drugs weaken the immune system, lowering the body's natural defenses and allowing for an increased risk of infection. Research shows that about 86% of those who have FS are positive for HLA-DR4, which is a cell surface receptor antigen.

More specifically, literature illustrates that the presence of two HLA-DRB1*04 alleles increases the susceptibility for extra-articular manifestations of RA and increases the chance of getting FS. Unfortunately, those who have the RA with extra-articular manifestations component of FS tend to have a worse prognosis and a higher risk for mortality.

Symptoms:

- Loss of appetite.
- Weight loss.
- Feeling discomfort or malaise.
- Joint pain.
- Stiffness in the joints.
- Pale colored skin.
- Joint swelling.
- Eye burning and discharge.
- Joint deformity.
- Repeated infections.

Treatment:

The best way of treating Felty syndrome (FS) is to control the underlying rheumatoid arthritis (RA). Immunosuppressive therapy for RA

often improves granulocytopenia and splenomegaly; this finding reflects the immune-mediated nature of FS. Most of the traditional medications used to treat RA have been used in the treatment of FS. No well-conducted, randomized, controlled trials support the use of any single agent. Most reports on treatment regimens involve small numbers of patients.

Surgical Treatment:

Splenectomy is sometimes performed in some patients who Have a severe condition Do not respond to pharmacological treatment Experience constant, serious infections Have hemolysis or recurrent skin ulcers

Medications:

Methotrexate is usually the first choice Hydroxychloroquine, methotrexate, Gold, Sulfasalazine, Cyclophosphamide, Rituximab± methotrexate, Leflunomide Ciclosporin,

II. CONCLUSION:-

It is most beneficial for pitta dosha. Guggul and kutki are two herbs that are specific for purification of the bones and best for treating kapha dosha in the asthi dhatu. Abhyanga or self massage using sesame oil, and Dashamularishta are good for vata pacification. However, these preparations should be taken in consultation with an Ayurvedic physician.

valuation of safety and efficacy of Laksha Guggulu, Mukta-Shukti Pishti, Ashwagandha Churna, and Pravala Pishti was done through studies conducted at peripheral institutes of CCRAS spread throughout various biogeographical areas of India.

The analysis of outcome of these scientifically planned studies demonstrates that in spite of the differences in gender, socioeconomic status, age group, Prakrati, and geographic region, Laksha Guggulu, Mukta-Shukti Pishti, Ashwagandha Churna, and Pravala Pishti proved to be safe in the management of osteopenia/osteoporosis.

REFERENCES:-

- [1]. Low Bone Density - Always Ayurveda.
- [2]. Ayurveda for bones and joints. eVaidyaJi-First Online Ayurveda Service Provider.
- [3]. AYURVEDIC TALK. Ayurveda and Yoga Blog - Herbal Remedies | Holistic Health. Herbal Remedies, Ayurveda India, Researches and News. Improving bone density through Ayurveda.
- [4]. Joint/bone health | Ayurveda Health.
- [5]. California College of Ayurveda. Asthi Dhatu:
- [6]. Albright Fuller, Reifenshtein Edward C Jr. The parathyroid glands and metabolic bone disease: Selected studies. Baltimore (MD): Williams and Wilkins; 1948.
- [7]. Bilezikian JP, Silverberg SJ. Clinical practice. Asymptomatic primary hyperparathyroidism. *N Engl J Med.* 2004 Apr 22;350(17):1746-51.
- [8]. Khadilkar AV, Mandlik RM. Epidemiology and treatment of osteoporosis in women: an Indian perspective. *Int J Womens Health* 2015 Oct;7:841-850.]
- [9]. Cosman F, de Beur SJ, LeBoff MS, Lewiecki EM, Tanner B, Randall S, Lindsay R; National Osteoporosis Foundation. Clinician's guide to prevention and treatment of osteoporosis. *Osteoporosis Int* 2014 Oct;25(10):2359-2381.
- [10]. Government of India. The Ayurvedic formula ry of India. Part I. 2nd ed. New Delhi: Government of India; 2003. p. 70.
- [11]. Government of India. The Ayurvedic formula ry of India. Part I. 2nd ed. New Delhi: Government of India; 2003. p. 224.
- [12]. Government of India. The Ayurvedic formula ry of India. Part I. 2nd ed. New Delhi: Government of India; 2003. p. 223.
- [13]. Samara singhe RM, Kanwar RK, Kumar K, Kanwar JR. Antiar-thritic and chondroprotective activity of Lakshadi Guggulu in novel alginate-enclosed chitosan calcium phosphate nanocarriers. *Nanomedicine (Lond)* 2014 May;9(6):819-837.