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Epidemiology of Osteoarthritis

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Abstract
The review is to describe the prevalence of osteoarthritis. Osteoarthritis is a dynamic activity of remodeling (recondition) and growth of new bone cartilage and connective tissue as well as focal deterioration of articular cartilage. And the common people residing locally regarding the sign and symptoms of osteoarthritis, risk factors causing osteoarthritis are also explained. Hip and knee are weight bearing joints are most common joint affected are wear and tear mechanism. Knee osteoarthritis as highly prevalent among hip and shoulder. This review tried to collect on the difference in prevalence rates by using sexual as well as geographical in India and also estimated the regional prevalence of osteoarthritis and also explain the anatomy of knee and stages of knee. In Osteoarthritis epidemiology very limited literature present.

Keywords
Osteoarthritis, cartilage, remodeling, weight bearing joints, prevalence, wear and tear.

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INTRODUCTION
Osteoarthritis (OA) is the joint disease, the most repeated chronic condition of the joints, affecting approximately 27 million Americans. OA can attack any joints, Degenerative condition affecting synovial joints. Osteoarthritis cause is unknown, erosion of the bone and cartilage cause exposed bone to rub. This causes pain, stiffness and inflammation. But it is mainly related to aging. Uncommon before age 40, most people of 70 have changes of osteoarthritis. Knee and hip are weight bearing joints. Hand, wrist is most common affect of osteoarthritis [5].
Symptoms include pain and stiffness in the joints and rubbing, grating or crackling sound when move the joint. The radiographic evidence of osteoarthritis about 80% of people above the age of 65 and symptomatic is about 25%of people. Mostly affected in the spine, hands, feet, Weight bearing joints like knee, hips. In United States affects over 20 million people. In United States, due to high aging population and obesity rate is increasing day to day leads to cause mobility related disability in osteoarthritis. By the year 2020, osteoarthritis prevalence is coming to double. The joint trauma is another factor in the increasing rate of osteoarthritis [4].

CLINICAL MANIFESTATION [6]
- Pain: pain occurs during movement or at rest. exacerbated with exercise
- Stiffness
- Loss of flexibility
- Swelling
- Crepitus
- Tenderness on joint
- Locking of knee
- Decrease range of motion.
- Irregular enlarged joint due to marginal osteophytes.
- Meniscal injury

- ACL Injury

ANATOMY OF KNEE

The knee is essential in movement of human body and also in running, walking and jumping. The knee is given due consideration to be the largest joint in the human body.

Joints can be arranged as functional joints and structural joints:

Functional joints are:

- Synarthrosis (immovable)
- Amphiarthrosis (slightly moveable)
- Diarthrosis (freely moveable)

Structural classification is:

- Synovial
- Fibrous
- Cartilaginous

The joints and its parts:

Joints are designed to allow movement between the bones and to absorb shock from movement like walking or repetitive motion. These movable joints are made up of the following parts.

Joint capsule: A tough membrane sac encloses all the bones and other joint parts.

Synovium: A thin membrane inside the joint capsule that secretes synovial fluid.

Cartilage: A hard but slippery coating on the end of each bone. Cartilage breaks down and wears away in osteoarthritis. Cartilage is a tough but flexible tissue that is the main type of connective tissue in the body. Around 65-80% of cartilage is water, although that decrease in older people, and the rest is a gel-like substance called the "matrix" that gives it is form and function [10].

Synovial Fluid: synovial fluid is produced in the spaces between certain joints to help reduce friction and facilitate movement between articular Cartilages. Certain disorders that causes severe pain and limited movement in the affected joints. Common Condition include rheumatoid arthritis, psoriatic arthritis, reactive arthritis and gout among others.

The synovial fluid in the joint capsule has four important functions:

- It keeps the bones slightly apart, protecting their cartilage covering from wear and tear.
- It absorbs shocks, again protecting the cartilage.
- It lubricates the joints, helping it to work freely and easily.
- It acts as a filter, nutrients reach the cartilage, but blocking the passage of harmful cells and substances.

The most important components of synovial fluid is a substance called sodium hyaluronate.it is this substance that lets synovial fluid perform its four different functions all at the same time. Most of the joints in yours body are synovial joints [19].

Ligament: Ligaments are bands of tough elastic tissue around joints. They connect bone to bone, give your joints support, and limit their movement [2].

Tendon:

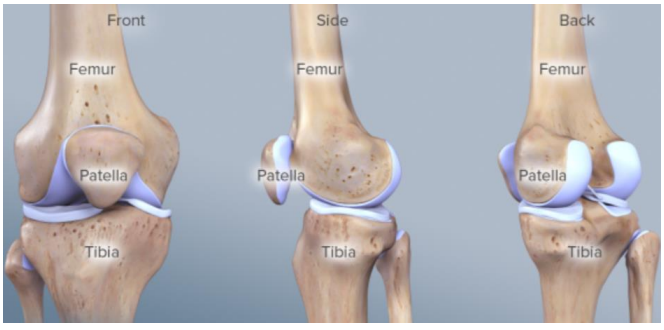
Tendons are the connective tissues that transmit the mechanical force of muscle contraction to the bones, the tendon is firmly connected to muscle fibres at one end and to components of the bone at its other end. Tendons are remarkably strong, having one of the highest flexible strengths found among soft tissues.

Knee joint is made up of three bones:

Femur
Tibia
Patella

Femur is the thigh bone. Shin bone is tibia. Smaller bone that runs alongside the tibia (fibula).knee cap is patella. Patella is the biggest bone in the body. In knee osteoarthritis effect in damage of cartilage between femur and tibia. Tendons help to move the knee joints by connect the knee bone to the leg muscle. Ligament are attached to the knee bone and provide stability to the knee.

The anterior cruciate ligament is located in the front of the knee. The ACL keeps the tibia from sliding out in front of the femur and provides rotational stability to the knee. Rupture of the anterior cruciate ligament (ACL) is a condition commonly seen in sports. The posterior cruciate ligament is located in the back of the knee [16, 9].



OSTEOARTHRITIS CAN BE CLASSIFIED IN 4 STAGES

Osteoarthritis, 1 grade.
Osteoarthritis, 2 grade
Osteoarthritis, 3 grade
Osteoarthritis, 4 grade

Stage 1 osteoarthritis: A person with stage 1 osteoarthritis shows very minor bone growth.

- In this stage one will usually not experience any pain or discomfort as a result of the very minor wear and tear.

Stage 2 Osteoarthritis:

- Osteoarthritis (OA) is considered a "mild" stage of osteoarthritis.
- Here the x-rays of knee joints will reveal greater bone growth.
- One may first begin experiencing symptoms like pain after a long day of walking.

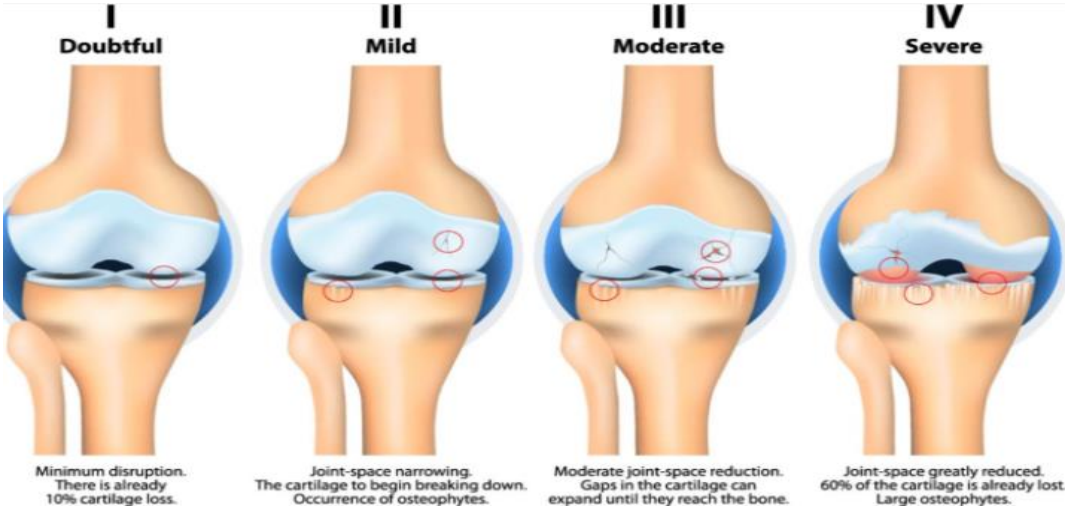
Stage 3 osteoarthritis:

Osteoarthritis is classified as "moderate" osteoarthritis.

- In this stage, the cartilage between bones shows obvious damage, and the space between the bones begins to narrow.
- One is likely to experience frequent pain when walking, running, bending or kneeling.

Stage 4 osteoarthritis: This stage is considered "severe"

One may experience great pain and discomfort while walking or moving the joint. That's because the joint space between bones is dramatically reduced and the cartilage is almost completely gone, leaving the joint stiff and possibly immobile [15].



PATHOPHYSIOLOGY:

A key role in the Pathophysiology of articular cartilage.

Normal cartilage has two components: Extracellular matrix rich in collagens (II, IX, XI) and proteoglycan (aggrecan), Isolated chondrocytes that lie within the matrix.

Osteoarthritis have abnormal cartilage and bone:

Here synovial joints of knee specifically two bones. Two bone there is progression. Some abnormal bone change of osteoarthritis and articular cartilage and slowly degrading. Synovial fluid which is present inside the synovial membrane called joint capsule [11, 12].

Articular cartilage is present in knee joint. Cartilage matrix (matrix of the cartilage) contain water and proteoglycan. Initially increase water contain and reduced proteoglycan cartilage become very weak. Person is during weight bearing on the joints called fibrillation.

The continuous rubbing of cartilage these two bones causes exposed of Subchondral bone. These exposed of Subchondral bone initially it is very soft and smooth and finally it become hard these stages called eburnation. Chondrocytes decrease (less ability to make new cartilage). Chondrocytes fail to synthesis a good quality matrix.

The margin of joints, here already cartilage is damage, margin new bone deposition is taken place. Osteoblast get goes and get deposited. These osteoblast new bone results in SubChondral sclerosis. Finally grow osteophytes. These are margin osteophytes present in margin called marginal osteophytes because of the cartilage particle from SubChondral bone enter in to the joint space and they produce loose bodies. Synovial membrane is also thickened. The joint become lax, joint capsule,

thickness, less viscous, weak in ligament surrounding in the final stage of osteoarthritis. Cartilage act as cushion is present in between the bones of joints and **cartilage prevent the bones rubbing against each other.** Synovial membrane is also thickened. **Leading to joint pain, movement difficult (problem) in joint of human being thus osteoarthritis** [21].

Mechanical "wear and tear" damage to joints

↓

Decrease in proteoglycan content in the bone matrix

↓

Abnormal chondrocytes signal

↓

Excessive production of chondrocyte degradation enzyme

↓

Sclerosis

↓

Bone spurs (osteophytes)

↓

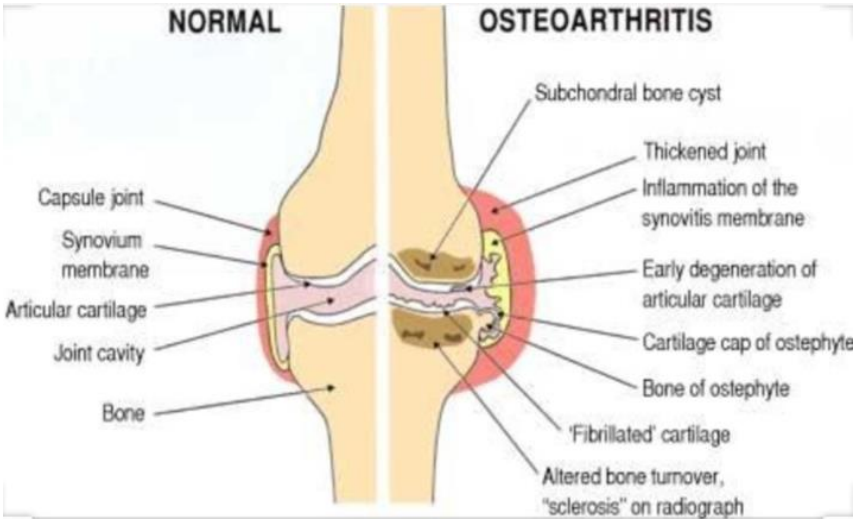
Eburnation

↓

Chondrocyte apoptotic process

↓

Cartilage destruction → **osteoarthritis**



EPIDEMIOLOGY:

In India, osteoarthritis has higher proliferative rate among world till 2025 expected to be at top rank in chronic disease. The eighth rank of globally osteoarthritis in all diseases and in all musculoskeletal problem covers around 15% proportion. The major risk in recent studies for the prevalence of osteoarthritis is obesity and aging. In diseases, compared to men, women are getting more [20].

The ranked as one in osteoarthritis, among the elders leading causes of disability. In developed and developing countries, enormous disability is the major causes of osteoarthritis and is responsible for the loss of productivity. the risk factors is also associated with modifiable and non-modifiable including obesity, lack of exercise, genetic predisposition, bone density, occupational injury, trauma, gender [4]

In globally suffer from osteoarthritis, 100 million people reported worldwide due to the most common cause of disability. In prevalence of moderate and severe disability as per the WHO report, In the age group of 0-59 and above 60years due to osteoarthritis in high income countries was 1.9 and 8.1. The low and middle income countries was 14.1 and 19.4 reported [14].

In India, osteoarthritis scores top 5 chronic disease, adult population affect about 4-6% of osteoarthritis. Osteoarthritis is a chronic, age related, degenerative which ultimately leads to joint failure. According to WHO, the women aged over 60years was estimated 9.6% of men and 18.0% of women have symptomatic osteoarthritis worldwide. In rheumatology, osteoarthritis is the second most common disease. In India, the prevalence of joint disease was estimated as 22% to 39%.

In the world, osteoarthritis is the most prevalent musculoskeletal disease. Globally knee osteoarthritis is 4th most significant causes of incapability in women and 8th in men. In osteoarthritis, the aged over 70years was estimated 40%, in which severe knee pain and disability shows nearly 2%. In United States, it is estimated 25million people in 2005 affected by arthritis. According to an estimated that from 2010 to 2031 in Canada, it is 13.6% to 18.6% increases the osteoarthritis. The prevalence increased with increase in age. Prevalence of osteoarthritis in women is 12.9% and 17.9% of more than 50years and in men it was 9.4% [8].

In above 50 years, due to limitation of joint movement disability is one of the most common cause in disability. In osteoarthritis, under the age of 45years 2% of the United States population was reported. this range increases to 30% of person between 45 to 64 and in age over 65-person range is 63 – 85%. In American population, at the age of 40years, osteoarthritis occurs in their weight-bearing joints is about 90% Men affect osteoarthritis at earlier age than women. Osteoarthritis affects about 14% of adults aged 25 and older, 34% (12.4 million) of those 65years plus. An estimated 27millions American adults have osteoarthritis (2005 stats) up from 21million in 1990 [16, 17].

RADIO-GRAPHIC OSTEOARTHRITIS (MODERATE TO SEVERE) PREVALENCE.

Hand - 7.3% (9.5% female, 4.8% male)
Feet - 2.3% (2.7% female, 1.5% male)
Hip - 1.5% (1.6% females, 1.4% males)
Knee - 0.9% (1.2% females, 0.4% males)

SYMPTOMATIC OSTEOARTHRITIS PREVALENCE:

Knee - 16% (18.7% females, 13.5% males)
Hand - 8% (8.9% females, 6.7% males)
Hip - 4.4% (3.6% females, 5.5% males)
Feet - 2% (3.6% females, 1.6% males)

KNEE OSTEEOARTHRITIS

The prevalence of knee osteoarthritis rates in USA based on population studies are comparable to those population in Europe. These studies reported that 1% of people in the aged group 25-34 (affected severe radiographic changes) and this range increases to nearly 50% in 75yrs above age groups. In the Framingham studies, in the aged over 45yrs conducted among participants). The prevalence of knee osteoarthritis diagnosed by radiographic was reported 19.2% and in those over 80years, the figure increases to 43.7%. According to Dutch institute for public health the date is produced about the prevalence of knee osteoarthritis. The aged 55 and above estimated 15.6% in men and women was 30.5%. In India, urban community is higher than those in the rural community in the knee osteoarthritis of the crude prevalence of clinically diagnosed. The urban community reported (5.5%) is higher among rural community is estimated 3.3%. After modifying the age and sex distribution in prevalence the rural communities' figures increases [13, 18].

Osteoarthritis in Different Region of India.

Table a) Regional demographic representation of osteoarthritis on the basis of sexual distribution [1]

State	Total OA (in %)	Male OA (in %)	Female OA (in %)	Author
Andhra Pradesh	68.0	72.0	59.5	supradeepth C *et al,* 2013
Bangalore	17.0	15.5	18.8	Ajit NE *et al,* 2014
Bihar	21.2	16.2	5.0	Barman SK *et al,* 2014
Jammu & Kashmir	24.9	-	-	Mahajan A *et al,* 2003.
Karnataka	41.3	20.6	57.0	Lena A *et al,* 2013
Maharashtra	10.2	7.0	11.0	Ganvir SD *et al,* 2013
Rajasthan	3.66	1.76	4.48	Ranwa *et al,* 2012
Uttarakhand	21.2	12.8	14.0	Jadhav VS *et al, 2012.*

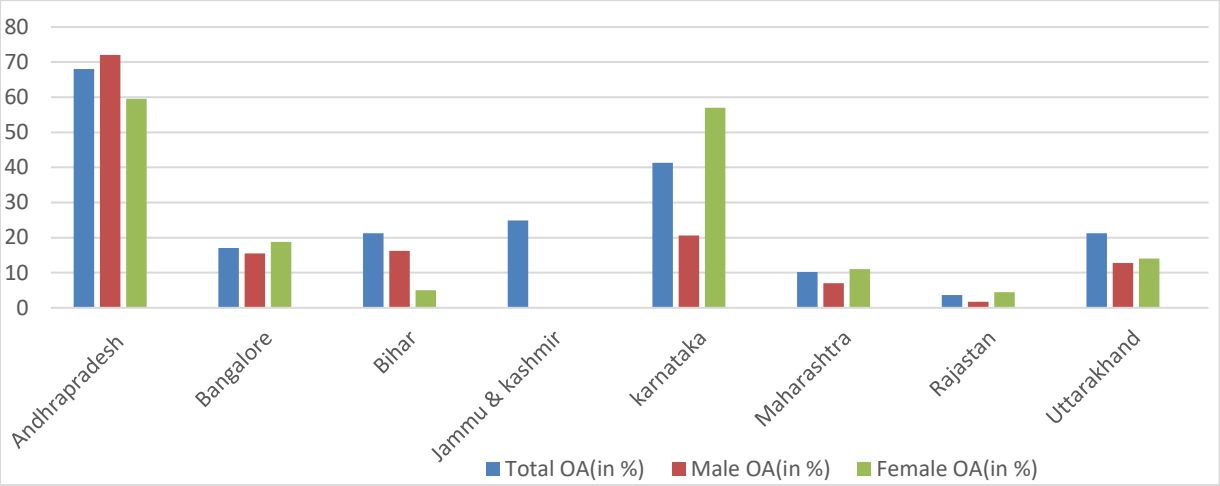


Figure 1: Comparative sexual percentage representation of osteoarthritis in different state of India.

ANDHRA PRADESH:

In Visakhapatnam district, the study is conducted in the urban and rural areas (Srinivas PJ et al, 2014). In among study population several types of morbidity shows 64% in Andhra Pradesh, out of which musculoskeletal problem with 34% morbidity in rural areas and in urban areas with 4.1%.In coastal population of Andhra Pradesh conducted another study in knee osteoarthritis was reported 68% out of which 72% male and in female was 59.55% patient complaining with joint pain (Supradeepth C et al, 2013).

BANGALORE:

The study population in the rural areas of Bangalore, the prevalence of osteoarthritis is 17%out of which 15.5% in males and 18.8% in females by using the modified ACR(American college of rheumatology) in 2009 criteria by using EULAR committee, In the population the overall prevalence shows 56%, consisting 4.2% in males and 68% in females while in population above 60years in elderly shows 54.1%.the 70 and above age group was found to be highest specific prevalence (Ajit NE et al, 2014).

BIHAR:

In Bihar, a study 21.25% arthritis of geriatric population on morbidity in which article of males are 16.25% and 5.00% in females (Barman SK et al, 2014).

JAMMU AND KASHMIR:

The Rheumatologic disorder in region around Jammu with a prevalence of 23.9% among which low back arthritis reported 34.7%, osteoarthritis shows 24.9%, soft tissue rheumatism represents 17.9%, rheumatoid arthritis shows 0.8% and unclassified arthritis shows 18.7%.(Mahajan A et al, 2003)

KARNATAKA:

In a study 41.3% of elderly population in udupi taluk, Karnataka prevalence of osteoarthritis shows 57% in females and 20.6% in males (Lene A et al, 2009).

MAHARASHTRA:

In Maharashtra, the prevalence of osteoarthritis was found 10.2% by using ACR (American college of rheumatology) criteria. It is more significant among women than men (11% vs. 7%) in the age group 60-79 years. Gender specific prevalence is 65.7% in females and 34.3% in males (approximately 2:1) ratio respectively (Ganvir SD et al, 2013).

RAJASTHAN:

The prevalence of various musculoskeletal disease in Rajasthan reported 8.42% arthritis (Prakash R et al, 2004). A study in Bikaner shows overall 3.66% prevalence of osteoarthritis in which contribution of males are 1.76% and females are 4.48% (Ranwa et al, 2012).

UTTARAKHAND/UTTARANCHAL:

The prevalence of osteoarthritis in elderly person of Chandigarh (UT) shows overall 56.6% out of which 32.6% in rural and 60.3% in urban areas. Which significantly higher among female (70.1%) than males (41.6%). In prevalence 50.2% is increased with age in 65 to 74years age groups, whereas in elderly shows 97.7% in the aged 84 years (or) older. Body mass index (BMI) with positive correlate was also reported and BMI below 25 shows 51.36% positively and BMI 40 (or) greater increased to 100% (Sharma MK et al, 2007). A studies of arthritis among the patients with any systemic disease (or) physical defects in Aurangabad represents 12.79% males and in females shows 14.02% (Jadhav VS et al, 2012).another study of arthritis in Dehradun shows 21.2% cases (Kakkar R et al, 2013).

CAUSES OF OSTEOARTHRITIS – THE RISK FACTOR:

The risk factor for osteoarthritis may include the following [18].

AGE: People above the age of 45 have the risk for developing osteoarthritis.it is however, most commonly found in people over age of 65.

GENDER: This disease of osteoarthritis is more common in women, particularly after the age of 55

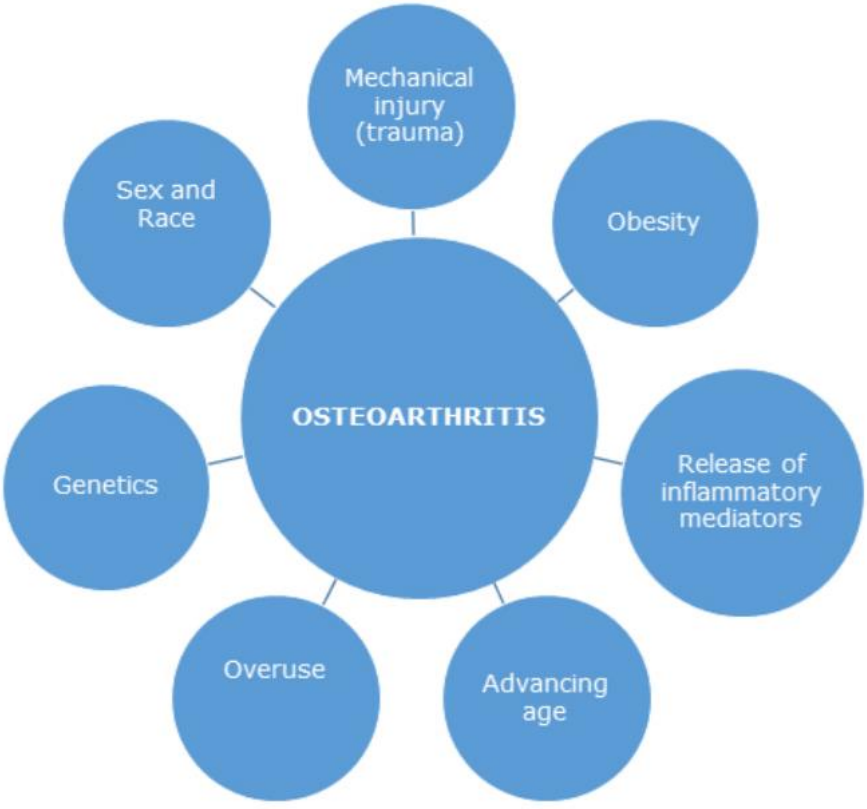
OBESITY: This can be one of the causes for osteoarthritis as every kilogram puts three extra kilograms of pressure on knees.

HEREDITY: Genes that are responsible for creating and maintaining cartilage might have a link with osteoarthritis.

INJURY: Fracture through joint or ligaments tear may cause osteoarthritis.

OVERUSE OF JOINTS: Repetitive use and injury in sports or occupation increase the risk of osteoarthritis.

WEAKNESS OF MUSCLES: weak thigh muscles lead to osteoarthritis knee joint pain.



DISCUSSION

Epidemiology is the study of the distribution and determents of disease and other health states in population. The epidemiology of osteoarthritis in India is explained by using sexual as well as geographical. The mild, moderate, severe stages of

knee and anatomy of knee is explained. Radio graphic osteoarthritis prevalence and symptomatic osteoarthritis prevalence is explained. To reduce pain, risk factors is to improve by muscular strength and functional ability suggest that stretch and strengthening exercise can take place. Osteoarthritis can't be prevented, but you may be reducing the risk of the diseases by maintain the self-care measure like losing weight (if you are overweight), aerobic exercise, strengthening exercise. Avoiding the overuse of the joints.

CONCLUSION:

From this study, it is concluded that – The 100 million people reported worldwide due to the most common cause of disability and mainly occurs in later life, in India highly prevalent osteoarthritis is reported as Andhra Pradesh and minimal prevalent osteoarthritis is reported as Rajasthan. Osteoarthritis symptoms, knee anatomy and stages of knee. The risk factors of osteoarthritis including age, gender, obesity, educational background and occupation. Females was reported to be more affected compared to males. In osteoarthritis prevalence has been concluded that the population is more in elderly age group than in population in young age groups and in prevalence of osteoarthritis female are getting more compared to males.

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