

Osteoarthritis

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Abstract

Osteoarthritis (OA) is the most common joint disorder in the community and is chronic in nature and is the most common joint disease in adults to the elderly worldwide. The disease most commonly affects the joints in the knees, hands, feet, and spine and is relatively common in the shoulder and hip joints. The diagnosis of OA was made on the basis of appropriate radiological and clinical findings. The most common predilection for OA is the lower extremities, namely the knees and hips so that OA is the most common cause of lower extremity disability in the elderly. Method: The method used in writing this literature review is a literature review. The writing of this article is based on data from several sources originating from related, latest journals and from trusted journal publication websites such as NCBI, Pubmed, Elsevier, Google Scholar, Clinical Orthopedics and Related Research, and other related portals. Conclusion: Osteoarthritis is a joint disorder that is often found in adults and the elderly. OA is known to most commonly affect the knee joint. There are several risk factors for OA, namely age, gender, obesity, genetics, excessive physical activity, history of trauma and joint surgery, and other disease conditions that usually attack the joints. Diagnosis is made clinically, radiologically, and with laboratory assistance. Management includes pharmacological and non-pharmacological therapy.

Keywords: Osteoarthritis; Elderly; Joints

Introduction

Osteoarthritis (OA) is the most common joint disorder in the community and is chronic in nature and is the most common joint disease in adults to the elderly worldwide. The disease most commonly affects the joints in the knees, hands, feet, and spine and is relatively common in the shoulder and hip joints. The diagnosis of OA was made on the basis of appropriate radiological and clinical findings. The most common predilection for OA is the lower extremities, namely the knees and hips, so that OA is the most common cause of lower extremity disability in the elderly. Osteoarthritis is also a disease that has a slow progression with different etiology. There are several risk factors for OA, namely age, gender, obesity, genetics, excessive physical activity, history of trauma and joint surgery and other disease conditions that usually attack the joints. The prevalence of OA increases with age and is more common in women than men (Sasono, Amanda, and Dewi 2020).

The purpose of writing this article is to collect information related to osteoarthritis in detail and in full so that it is easier for readers to understand in full the information related to osteoarthritis and can benefit from this article.

Method

The method used in writing this is a literature review. The writing of this article is based on data from several sources originating from related, latest journals and from trusted journal publication websites such as NCBI, Pubmed, Elsevier, Google Scholar, Clinical Orthopedics and Related Research, and other related portals.

Discussion

a. Definition

Osteoarthritis (OA) is a long-term chronic disease characterized by cartilage damage in the joints which causes the bones to rub against each other and cause stiffness, pain, and movement disorders (World Health Organization 2013). This disease causes progressive disturbances in joint tissues such as cartilage, synovium, and subchondral bone. In the end, the joint cartilage degenerates so that the joint surface fissures, ulcerates, and becomes thin (Wijaya 2018). Osteoarthritis can occur due to the biochemical breakdown of the articular (hyaline) cartilage in the synovial joint of the knee so that the joint cartilage is damaged. This disorder develops slowly, asymmetrically and non-inflammatory, characterized by degeneration of joint cartilage and the formation of new bone (osteophytes) at the edges of the joints (Marlina 2015).

b. Epidemiology

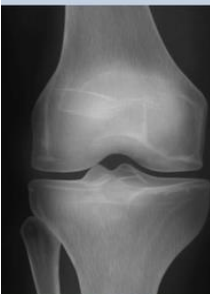
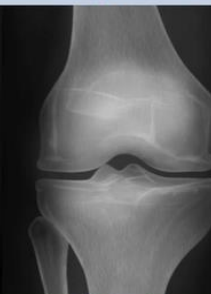
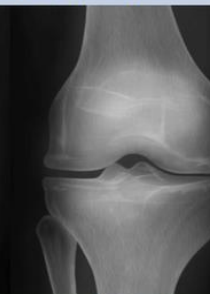
It is estimated that 10% to 15% of all adults over the age of 60 have osteoarthritis (OA), with a higher prevalence in women than in men. According to the United Nations, by 2050 people over the age of 60 will make up more than 20% of the world's population. Of that 20%, an estimated 15% will have symptoms of OA, and one-third of these people will be severely disabled. This means that by 2050, 130 million people will have OA

worldwide, 40 million of whom will be severely disabled as a result of the disease. Across the EU Member States, the prevalence of diagnosed OA varies from 2.8% in Romania to 18.3% in Hungary (World Health Organization 2013). Data from the Indonesian Ministry of Health shows that the number of sufferers of joint disease, especially OA as many as 55 million people (24.7%) with an age range of 55-64 years as much as 45%, 65-74 years 51.9% and ages over 75 years 54.8 % (Sasono, Amanda, and Dewi 2020).

c. Classification

Osteoarthritis was radiologically identified based on the radiological findings in the form of osteophytes, loss of joint space, and sclerosis. Osteoarthritis was radiologically classified according to its severity using the Kellgren-Lawrence (KL) grading score. The Kellgren and Lawrence grading scale has been approved by WHO as the reference standard for epidemiological studies cross-sectional and longitudinal. The KL grading system is still considered the gold standard for the initial assessment of the severity of knee osteoarthritis on radiographs. The KL grading system categorizes knee OA severity into five levels (grades 0 to 4). The KL grading scheme for measuring the severity of knee OA from X-ray images is defined as follows.

- Grade 0: absence of radiographic features such as cartilage loss or osteophytes.
- Grade 1: suspicious joint space narrowing, osteophyte growth, bone marrow edema, and subchondral cysts.
- Grade 2: Visible osteophyte formation and reduced joint space width on anteroposterior load-bearing radiographs with bone marrow and subchondral edema.
- Grade 3: multiple osteophytes, definite joint space narrowing, sclerosis, possible bone deformity.
- Grade 4: large osteophytes, marked joint space narrowing, severe sclerosis, and definite bone deformity (Antony 2018).

Kellgren-Lawrence (KL) grading scale					
					
Grade 1		Grade 2		Grade 3	
CLASSIFICATION	Normal	Doubtful	Mild	Moderate	Severe
DESCRIPTION	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

*Source: <http://www.adamondemand.com/clinical-management-of-osteoarthritis/Kellgren>

d. Risk Factor

Age and Gender

Age is a major risk factor, the aging process will reduce the number of chondrocytes in the joint cartilage and will directly correlate with the degree of cartilage damage. The prevalence in women is greater than in men, the severity of OA is also greater in women (Vina and Kent Kwoh 2018).

Obesity

People with obesity are at higher risk of developing OA than people with a normal body mass index. There are several mechanisms that can occur, including increasing joint load, especially on weight-bearing joints, changing behavioral factors such as decreased physical activity which ultimately eliminates the protective ability and strength of the muscles around the joint. In knee OA, obesity causes weakness of the muscles around the knee joint and increases the number of cases of arthroplasty. In addition, fatty tissue can also be found behind the patella in the knee joint area, commonly called the infrapatellar fat pad, this fat tissue can produce adipokines, which are cytokines produced by fat cells, such as leptin, adiponectin, resistin, and visfatin. These adipokines can be dysregulated which can secrete proinflammatory factors (Vina and Kent Kwoh 2018).

Genetics

Approximately 30%-65% of the risk of OA is genetically determined. A recent review highlights the main findings from genetic association studies in OA to date. They report that genome-wide Associated Scan (GWAS) studies have so far identified 21 independent susceptibility loci for OA. Data from the Chingford study also found that the SNP rs11688000 in the neurokinin receptor 1 (TACR1) gene was associated with a reduced risk of symptomatic OA (Vina and Kent Kwoh 2018).

Joint problems

The shape of the bones can contribute to the risk of OA, especially in the hip joint. The relationship between muscle strength and OA can vary depending on the muscles and joints studied. In the examination of knee injuries anterior cruciate ligament (ACL), high thigh muscle cross-section (CSA), and high muscle/fat ratio had a protective effect on the prevalence of knee OA and certain repetitive activities and occupations continued to be associated with a greater risk of developing OA. In addition, a history of joint injury or ACL surgery, then the presence of synovitis and abnormalities in the bone marrow, cartilage, and meniscal abnormalities can all increase the risk of OA (Vina and Kent Kwoh 2018).

e. Signs and Symptoms

Hand

- Pain in range of motion Hypertrophic changes in the distal and proximal interphalangeal joints.

- Tenderness in the carpometacarpal thumb joint (Sinusas 2012).

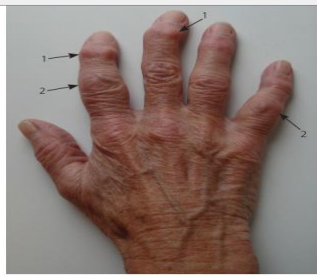


Figure 1. Hand affected by osteoarthritis. (1) Heberden nodes. (2) Bouchard nodes.

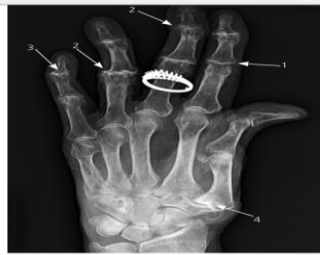


Figure 2. Radiograph of a hand affected by osteoarthritis showing (1) joint space narrowing, (2) osteophytes, and (3) joint destruction. Also note changes at carpometacarpal joint (4), which are very common in osteoarthritis.

Shoulder

- Pain in range of motion Limited range of motion, especially external rotation.
- Crepitus in the range of motion (Sinusas 2012).

Knee

- Pain in range of motion Joint effusion Crepitus in range of motion Presence of popliteal cyst.
- Valgus lateral instability or varus deformity (Sinusas 2012).



Figure 4. Radiograph of the knee in (A) anteroposterior and (B) lateral views showing (1) joint space narrowing and (2) osteophyte formation.

Pelvic

- Pain on range of motion.
- Pain in the buttocks Limited range of motion, especially internal rotation (Sinusas 2012).

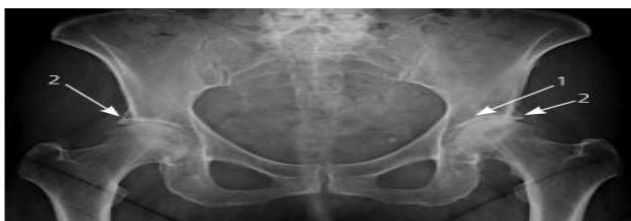


Figure 3. Radiograph of the hips showing (1) joint space narrowing and (2) osteophyte formation.

Feet

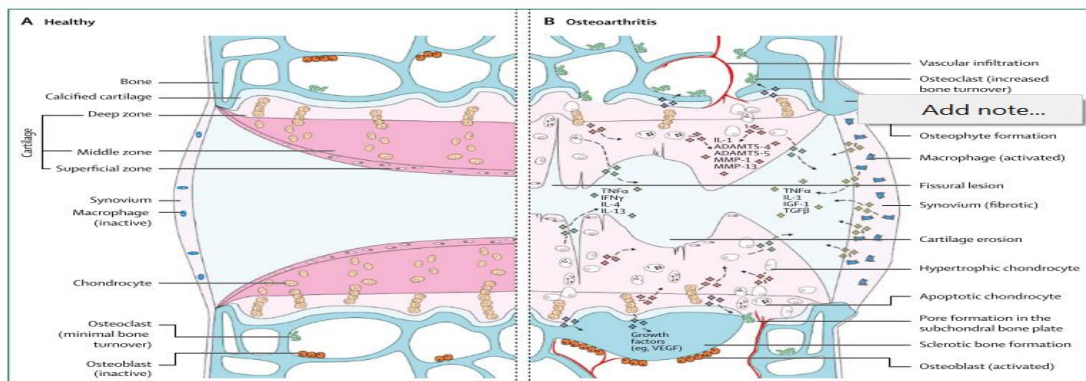
- Pain on ambulation, especially in the first metatarsophalangeal joint.
- Restricted range of motion of the first metatarsophalangeal joint, hallux rigidus.

- Hallux valgus deformity (Sinusas 2012).

Spine

- Pain on a range of motion.
- Limited range of motion Lower extremity sensory loss, loss of reflexes, motor weakness caused by nerve root impingement.
- Pseudoclaudication is caused by spinal stenosis (Sinusas 2012).

f. Pathogenesis



The cartilage will produce a new matrix to repair itself due to mechanical or chemical injury, in the case of OA chondrocytes fail to synthesize matrix and maintain a balance between degradation and synthesis of extracellular matrix, including excessive production of collagen types I, III, VI, and X and short proteoglycan synthesis. . As a result, there is a change in the diameter and orientation of the collagen fibers that alter the biomechanics of the cartilage, so that the joint cartilage loses its compressibility properties. When the cartilage is injured or traumatized, it will trigger the release of degradation enzymes, such as Strome lysin and Matrix Metalloproteinases (MMP). Strome lysin degrades proteoglycans and MMP degrades extracellular matrix proteoglycans and collagen. Tissue inhibitors of metalloproteinases (TIMP), which generally function to inhibit MMP, cannot work optimally because they tend to be acidic in the joint cavity due to Strome lysin (pH 5.5), while TIMP can only work optimally at pH 7.5. Aggrecons will break down proteoglycans in the articular cartilage matrix called aggrecon. There are two types of aggrecons, namely aggrecons 1 (ADAMT-4) and aggrecons 2 (ADAMT-11). Other enzymes that contribute to the breakdown of type II collagen and proteoglycans are cathepsins, which act at low pH, including aspartate proteinases (cathepsin D) and cysteine proteinases (cathepsins B, H, K, L, and S) which are stored in chondrocyte lysosomes. Hyaluronidase is not present in articular cartilage, but other glycosidases play a role in destroying proteoglycans. In OA, inflammatory mediators play a role in disease progression. In addition to the release of degradation

enzymes, pro-inflammatory factors are also induced and released into the joint cavity, such as Nitric Oxide (NO), IL-1 β , and TNF- α . These cytokines induce chondrocytes to produce proteases, chemokines, and eicosanoids such as prostaglandins and leukotrienes by attaching to receptors on the surface of chondrocytes and causing transcription of the MMP gene so that the production of these enzymes increases. As a result, matrix synthesis is inhibited and cell apoptosis is increased. The most important cytokine is IL-1. IL-1 plays a role in decreasing the synthesis of collagen types II and IX and increasing the synthesis of collagen types I and III, resulting in a poor-quality articular cartilage matrix. In the end, the subchondral bone will also play a role, where the osteoblasts will be stimulated and produce proteolytic enzymes (Hunter and Bierma-Zeinstra 2019).

g. Management

The main management of OA cases is to recognize and treat symptoms, reduce pain and disability, improve joint function and joint stability. Treatment options consist of a combination of pharmacological and non-pharmacological therapies. In OA with Kallgren-Lawrence grades 1-3, non-pharmacological therapy can be performed without surgery, while in OA with Kallgren-Lawrence grades 4, non-pharmacological therapy with surgery can be performed. In addition, providing education is also very important in OA patients. With education, patients know the goals of OA therapy and the importance of lifestyle changes, exercise, and weight loss that will affect the course of the disease (Wijaya 2018).

Conclusion

Osteoarthritis is a joint disorder that is often found in adults and the elderly. OA is known to most commonly affect the knee joint. There are several risk factors for OA, namely age, gender, obesity, genetics, excessive physical activity, history of trauma and joint surgery, and other disease conditions that usually attack the joints. Diagnosis is made clinically, radiologically, and with laboratory assistance. Management includes pharmacological and non-pharmacological therapy.

References

- Antony, Joseph. 2018. "Automatic Quantification of Radiographic Knee Osteoarthritis Severity and Associated Diagnostic Features Using Deep Convolutional Neural Networks." (November).
- Hunter, David J., and Sita Bierma-Zeinstra. 2019. "Osteoarthritis." *The Lancet* 393(10182): 1745–59.
- Marlina, T. 2015. "Efektivitas Latihan Lutut Terhadap Penurunan Intensitas Nyeri Pasien Osteoarthritis Lutut Di Yogyakarta." *Jurnal Keperawatan Sriwijaya* 2(1): 44–56.
- Sasono, Bimo, Nova Aulia Amanda, and Desak Nyoman Surya Suameitria Dewi. 2020. "Faktor Dominan Pada Penderita Osteoarthritis Di RSUD Dr. Mohamad Soewandhie, Surabaya, Indonesia." *Jurnal Medika Udayana* 9(11): 3–8.
- Sinusas, Keith. 2012. "Osteoarthritis:Diagnosis and Treatment." *American Family Physician* 85(1): 49–56.
- Vina, E.R., and C Kent Kwoh. 2018. "Epidemiology of Osteoarthritis: Literature Update Ernest." *Physiology & behavior* 30(2): 160–67.
- Wijaya, Sandy. 2018. "Osteoarthritis Lutut." *Cdk* 45(6): 424–429.
- World Health Organization. 2013. "Essential Medicines and Health Products - Priority Diseases and Reasons for Inclusion - Osteoarthritis." *World Health Organization* 12: 6–8.

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