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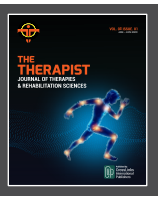

Review Article

Mechanical Causes of Osteoarthritis in Adults, its Diagnosis and Treatment

Maria Fayyaz[1*], Bushra Muneer[2], Aqsa Iqbal[3], Mohammad Asad Bilal[1], Huma Tabassum[4] and Sumbal Shahbaz[1]

[1]Department of Health Professional Technologies, The University of Lahore, Lahore, Pakistan
[2]Institute of Industrial Biotechnology, GC University, Lahore, Pakistan
[3]Afro-Asian Institute, Lahore, Pakistan
[4]Institute of Social & Cultural Studies, University of the Punjab, Lahore, Pakistan

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***Corresponding Author:**
Maria Fayyaz
Department of Health Professional Technologies, The University of Lahore, Lahore, Pakistan
mariafayyaz58@gmail.com

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ABSTRACT

Osteoarthritis (OA) is one of the most devastating chronic conditions that affects adults and aged people around the world. After the age of 65 years, osteoarthritis affects women (70%) more frequently than it does in men (60%). The objective of this study is to find the main causes and treatment strategies for OA. The etiology of OA is multifactorial, with metabolic, inflammatory, and mechanical causes. A number of risk factors including occupation, obesity and injury may initiate various pathological pathways. The main goals of treatment are to minimize impairment, enhance function, and effectively manage pain. In cases of moderate to severe pain, acetaminophen and NSAIDs are more beneficial; nevertheless, they carry a higher risk of major side events involving the upper gastrointestinal tract. The most researched and successful nonpharmacological therapies are patient education, self-management, and exercise. Although nonpharmacological interventions are regularly and widely utilized in the therapy of OA patients, there is little evidence that they are helpful. Requiring a periodic assessment and adjustments of therapy rather than the strict continuation of a single treatment, as the patient's requirements and the course of the disease typically alter over time.

INTRODUCTION

Arthritis is the swelling and stiffness of one or more joints. Joint stiffness and pain are the main signs of arthritis, and these symptoms usually get worse as you get older. Osteoarthritis (OA) is a form of arthritis that affects function and causes joint pain [1]. The main focus of our study is osteoarthritis, which is one of the main disorders that can arise from joint inflammation [2]. OA is a heterogeneous set of disorders that causes signs and symptoms linked to the damaged articular cartilage and related changes in bone shape. It is regarded as the most common type of arthritis and one of the most important health issues that affect our modern world. OA is typically regarded as a chronic condition that affects adults also. But in addition, increasing age, genetics, obesity, joint damage, work, gender, and race are also its risk factors [3]. Historically, related to advanced age, OA is increasingly recognized as complete "joint failure" [4]. It is a chronic musculoskeletal condition that affects the moveable joints, like the knee and hip joints and a whole hip or total knee replacement is most frequently performed due to OA [5, 6]. Hip and knee osteoarthritis can affect younger adults, it has a significant impact on their psychological

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well-being . Age, obesity, gender, higher bone density, joint laxity, and too much mechanical stress have all been recognized as risk factors [7]. Young adult's knee osteoarthritis can be more clearly observed whenever it develops after a knee injury because these injuries are frequent and pushes people in highest category to seek medical attention [8]. Environmental, bio-mechanical, and biochemical elements, in addition to ageing, can also play a role in the development of osteoarthritis. It affects all of the joint's structures, including the articular cartilage, sub chondral bone, meniscus, and synovial membrane [9]. Degeneration of cartilage, remodeling of the subchondral bone, the development of osteophytes, and changes to the synovium and joint capsule are some of the structural features of OA that are generally observed. An understanding of the cause of pain is required for the best treatment of this disease [10]. The most common OA symptom and the one that typically leads patients to seek therapy is pain. OA discomfort is often made worse by using the affected joints and is made even better by rest. While it may spread beyond the affected joint and, in some situations, may be transferred, for instance, pain may rarely be felt in the thigh or knee in patients with hip OA [11]. People with OA and other serious diseases are less likely to get a diagnosis or a suggested course of treatment. Additionally, physical activity and exercise, along with self-management techniques are only partially successful, being efficient and safest method of therapy for these people [12]. There are four basic types of treatment options: non pharmacological, pharmacological, complementary and alternative medicine (CAM), and surgery. Surgery should only be used to treat patients who do not improve with pharmaceutical therapy, and having unbearable pain and loss of function [9]. A number of factors play a significant role in the development and progression of OA, including age-related to the limb overloading, misalignment, hereditary diseases, and metabolic syndromes [13]. Using laboratory and radiographic evaluation, it is necessary to identify and classify the intensity of an arthritic condition [14]. In the past, radiographs that show osteophytes and joint space width (JSW) have been used to diagnose OA using imaging. Recent developments in soft tissue representation in other imaging techniques, including magnetic resonance imaging (MRI), ultrasound, and optical coherence tomography (OCT), have improved the diagnosis and treatment [15].

Occurrence of Osteoarthritis

While osteoarthritis is more common in older individuals, it can also affect a lot of young people in their 20s and 30s. The wide variety of disorders impact the joints and result in symptoms that are related to the cartilage's stability being affected. The complete body is affected by osteoarthritis. Structural but also physical hazards that can be controlled and those that cannot, play a role in the progression of joints sensitivity and then, ultimately, osteoarthritis [16]. Living standards are significantly compromised as a result of osteoarthritis, which is a leading factor of joints discomfort and postural instability [17]. Commonly called inflammatory joint disorder is knee OA that is primarily brought on by surface roughness as well as the gradual removal of fibro-cartilage. It frequently affects older people. Primary and secondary osteoarthritis can be distinguished from one another. Soft tissue destruction after a visible fundamental cause is primary OA. Secondary OA results from either defective articular cartilage, like in rheumatoid, or improper force distribution throughout joints, as in post-traumatic reasons [18]. Knee is the biggest synovial joint in adults and responsible for creating the synovial fluid, which nourishes and smooths the vasculature tissue [19]. A major increased incidence of osteoarthritis of the knees is a joint accident caused in early life [20, 21]. The hip joint is one of the largest weight-bearing joints in the body, but secondary to the knee joint that are affected by OA. According to present recognized knowledge, hip OA involves the overall joint in addition to the articular cartilage. It can affect the major joints in the lower extremities, particularly the hips, and can cause serious physiological damage that can impair mobility and increase the need for medical care. The onset of hip OA is associated with a number of risk variables, including age, gender, genetics, obesity, and regional joints risk factors [22]. Numerous people suffer from severe spinal arthritis illnesses, which also significantly contribute to disease, impairment, or medical costs. As a result, these disorders are a major cause of discomfort for those who are suffering [23].

Mechanical Causes of Osteoarthritis

Gender

Females are highly susceptible as compared to males to experience the indications of knee OA [24]. Compared to women, men are much less likely to develop OA of the hands and knees, but they are more inclined to develop cervical spine disc degeneration. Similarly, gender differences in cartilage thickness have been identified. In a small study applying quantitative three-dimensional MRI, the distal femur cartilage thickness was observed by Faber and his colleagues to be lower in women than in men [25].

Genetics

The available evidences suggest that genetic factors play a major role in OA. For more than fifty years, it has been accepted that certain types of osteoarthritis have a significant hereditary component. Recent research found this genetic contribution to be as high as 65% [26]. It is uncertain what genetic factors may play a role in osteoarthritis; these could include structural

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abnormalities, changes in the metabolism of bone or cartilage, or even a genetic influence on a known risk factor for the condition, such obesity. Recent research has demonstrated the significance of collagen type 2 mutations in certain uncommon, familial forms of osteoarthritis[27].

Injury

Any triggering event that results in joint damage, such as fractures, cartilage destruction, ligamentous injury, or meniscal injury, may result in traumatic OA [28]. An intra-articular fracture, a ligament pull, or another injury to the cartilage within a joint can produce post-traumatic osteoarthritis [29]. Patients who are younger in age and people who are healthy and active have a higher risk of developing OA after major joint trauma. Joint dislocations are common after a traumatic event to the joint, known as long-term complication [30]. Doctors who treat professional athletes frequently see patients who have joint tightness and pain. This generally accepted view states that sustained participation in sports increases the risk of osteoarthritis. In other words, people who lead active lifestyles are more likely to develop the disease because their joints are subjected to greater wear and tear [31].

Obesity

Obesity is a leading cause of the formation of OA. According to numerous studies, Body mass index has been linked to a higher risk of this disorder in both hips, knees, and ankle. Because obesity occurs before the onset of OA, it is suggested that obesity is responsible for the start of the degenerative processes [32]. Weight loss required to reduce symptoms and stop the continuation of the illness is uncertain. However, obese patients with osteoarthritis will receive symptomatic reduction with weight loss. Being overweight increases the likelihood of rapid disease development in people with knee osteoarthritis; people who already have osteoarthritis in one knee are more likely to develop it in the other if they are overweight. Obese people with osteoarthritis are frequently eligible for complete knee and total hip replacement operations, which effectively relieve pain and suffering [33]. The main indications and symptoms of OA include pain that usually develops slowly and is categorized as mechanical or activity-related, diminished capacity, stiffness after inactivity, and joint buckling or bowing [34].

Diagnosis

Joint discomfort is the most typical sign of osteoarthritis. The gelation effect refers to how pain seems to get much worse with movement, specifically after a time of resting. While with rheumatoid arthritis, which produces morning stiffness that can last 45 minutes or longer, osteoarthritis can cause morning stiffness, but it often will last only about 30 minutes. Patients might complain of locked joints and unstable joints. Due to discomfort and tightness, such conditions compel sufferers to reduce their routine work, which results in a general reduction in performance. Specialists usually properly diagnose osteoarthritis depending upon that patient's clinical examination. Plain radiography is useful for both validating the diagnosis and excluding alternative illnesses. Advanced imaging techniques, such as computerized tomography or magnetic resonance imaging, are rarely required [9].

Patient History

It is important to evaluate each patient's age, weight, and level of exercise because these variables may have an impact on the choice of the most suitable operational applicant. Recognize that osteoarthritis patients usually have localized knee pain. It's important to look into any prior surgeries or injury histories [35].

Physiological Checkup

The physiological checkup must involve a determination of body weight, BMI, structural flexion, pain site, muscular endurance, and tissue flexibility. To rule out involvement of the lower extremity joints, evaluation of muscle fat and posture stability during the exercise must be done. To bodily divide the lower legs and thighs over their lengths, the doctor may use a goniometer. The center of the patella and foot must be located and marked using just a pen. The forelimbs are extended along the middle of the thighs, along the line of the upper thigh to the center of the ankles, and the center of the goniometer is just below the kneecap [36].

Radiology

Irregular joint gaps, synovial fibrosis, bony abscesses, osteophytosis, and hyper-osteogeny along the edges of the joints are all abnormalities seen on plain film radiography. In some circumstances, floppy objects and malformation of a joint may be seen [37].

MRI

In an MRI, picture intensity is altered to highlight various tissue types. Proton density (PD), T2-weighted imaging, and 2D or multi-slice T1-weighted imaging are typical contrasted techniques. Focused tissue abnormalities can be assessed using the imaging techniques of spin echo (SE) and fast-spin echo (FSE) [15].

Treatment

Osteoarthritis has no known treatment but, treatments that help relieving discomfort, also rectify abnormalities to enhance the person's self-esteem. Combining medical and non-medical therapies is preferable. Surgery is the best option when heading to drug rehab on your own after conventional treatment fails or is ineffective [37].

Non-pharmacological treatment

Non pharmacological therapy is essential in the treatment of osteoarthritis and is suggested for all OA patients. All of

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those are typically the first therapies doctors advise because they can reduce your joint inflammation and have few harmful effects. Those who give such methods a try, frequently see some relief in their OA discomfort and capacity for carrying out daily tasks [38]. Exercising is perhaps a best useful, adaptable, as well as affordable treatment option provided to support patients suffering from osteoarthritis to achieve their goals. Numerous types of exercises have been shown to being essential for attaining treatment targets; enhancing overall health and lowering subsequent suffering; and changing potential causes in diseased process. The advantages of adequate activity in the management of osteoarthritis may extend to a possible disability caused by this condition. Patients with osteoarthritis should see physical therapists and fitness specialists in medical and community-based organizations. Physical and psychological therapists work out of therapy to lessen discomfort, increase effort, and prevent further impairment. Courses for workout and physical activity are advised by wellness and workout trainers [39]. Changes in weight-bearing exercise behaviors in the lower body can be made using orthopedic shoes intended for treating varus or valgus deformity [40]. Numerous studies have shown that weight-bearing has an impact upon the progression of osteoarthritis. For conditions to continue to have an influence on the knee and hip joints, pressure on the joint surface is critical. Exercising does have a noticeable influence on osteoarthritis problems, but the potential stress on knees from such weight-bearing activity is concerning, particularly given signs of negative effects on the joints during training [41].

Pharmacological treatment

Acetaminophen, non-steroidal anti-inflammatory medicines (NSAIDs), and corticosteroids are just some of the main oral medications now used to treat osteoarthritis. The use of NSAIDs for treating osteoarthritis is controversial. It is due to the understanding of the digestive and urinary abnormal impact of NSAIDS, in the elderly generation most impacted by knee pain, the understanding that the level of inflammatory processes through OA is usually benign, or worries regarding potential negative effects of NSAIDs on articular cartilage metabolism. For this reason, mild relievers like paracetamol were recommended for treatment of OA with short-course pain medications as necessary [42].

Surgical Treatment

OA can be surgically treated in two methods: conservatively, by leaving the damaged cartilage alone, or radically, by replacing the cartilage with an artificial prosthesis. Conservative therapy is typically provided to younger patients in an attempt to delay, if not entirely avoid, the need for joint prostheses. Arthroscopy and total joint arthroplasty are now both surgical options for treating osteoarthritis of the joint. Such methods include joint-preserving spacers, and different repairs, which are thought to be less intrusive than total joint surgery. Total joint arthroplasty of the knee joints is seen to be among the most economically advantageous surgical treatments [43].

CONCLUSIONS

The overall load of osteoarthritis (OA) is rising because symptomatic OA is more common in the aging global population and because symptom-relieving and disease-modifying treatments are insufficient. The mechanisms underlying the many clinical characteristics of osteoarthritis (OA) are becoming clearer with new insights into its pathophysiology. Treating OA necessitates a comprehensive approach. Symptomatic treatment must be accompanied by education and preventive actions.

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Conceptualization: BM
Writing-review and editing: MF, AI, MAB, HT, SS
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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