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# OSTEOARTHRITIS: ITS PREVALENCE, CAUSES, PATHOGENESIS, RISK FACTORS, AND TREATMENT

**223 Nursing**

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## Abstract

Osteoarthritis is the leading cause of disability in America, affecting persons of all ages, sexes and races (Arthritis Foundation, 2017). There are two main forms of OA: primary OA and secondary OA.

Primary OA is a chronic degenerative disease related to aging. Although not caused by aging, as a person ages the water content in the cartilage decreases, making the joint less resilient and more at risk of degeneration. There is believed to be a genetic factor involved as well.

Secondary OA begins earlier in life, usually resulting from a specific injury or trauma, repetitive motion injury, or comorbidity of diabetes or obesity. Since the presenting symptoms are the same, i.e., joint pain and stiffness exacerbated by use or exercise, statistically, the two conditions are not generally reported separately.

There are several compelling reasons why researchers are predicting a dramatic increase in the prevalence of osteoarthritis in the coming decades. One is because the condition is associated with advancing age, and, with people in Western countries living longer than ever, the number of elderly people at risk for osteoarthritis is expected to increase. Added to this is the number of young and middle-aged people who are overweight because obesity can be damaging to the joints. A third reason is the large number of people who have suffered injuries, which can also increase their risk of OA (Hunter & Bierma-Zeinstra, 2019).

The CDC currently funds twelve state arthritis programs with the following goals:

(A) to strengthen partnerships with other chronic disease programs, state Arthritis Foundation chapters/regions, and other partners, improve their ability to monitor the burden of arthritis in their state,

(B) to coordinate activities to increase public awareness that something can be done to address the burden and impact of arthritis, and (C) to Expand efforts to promote self-management education and physical activity to adults with arthritis (CDC, 2017).

More research is needed to find better diagnostic tools and medicines targeted at reducing or reversing the damage caused by OA, in order to ease suffering and reduce the economic burden of OA in the U.S. and throughout the world (Wittenauer, Smith & Aden, 2013). Currently, the best approach to preventing OA or successfully living with it is to stay active and healthy and once diagnosed with the disorder, to exercise, keep the pounds off, relax, get educated, build and maintain a social support system, and adhere to the prescribed medication regimen.

# CONTENTS

# INTRODUCTION

In November, 2021, researchers in Australia reported that a promising treatment for osteoarthritis had failed (Gever, 2021). The treatment was platelet-rich-plasma (PRP), and it involves removing platelets from a patient's blood, combining them with the patient's own plasma, and injecting the mixture into a target area, such as a wound, in order to accelerate the healing process (Gever, 2021).

Platelets contain a growth factor which researchers believed might stop or reverse joint degradation. The controversial method has been used to treat a variety of conditions, and researchers had great hope that it would successfully relieve pain and reverse the destruction of cartilage in patients with osteoarthritis, a form of arthritis, the generic name for any condition that causes pain and swelling in a joint. There are over 100 conditions which can be called arthritis, but osteoarthritis, also known as degenerative joint disease, is the most common (Gever, 2021).

A few earlier studies suggested that PRP might be the answer to the prayers of tens of millions of people, but the treatment was no more successful than a placebo (Gever, 2021). The search for a cure for OA, one of the most common and disabling disorders in the world, would have to go on.

Osteoarthritis (OA) is a disorder of the joints, primarily affecting the cartilage. It is the most common form of arthritis - an umbrella term that encompasses over 100 different forms of the disease and related conditions.

Osteoarthritis is so common that almost everyone will develop some form of the condition if they live long enough (Ammer, 2009).

OA is the most common joint disorder in the United States and the single most common cause of disability in older adults worldwide. In the United States between 2013-2015 an estimated 54.4 million adults had been diagnosed with some form of arthritis. Osteoarthritis, being the most common form of arthritis, is estimated to affect 27 million Americans and this number is projected to increase to 78 million by 2040 (CDC, 2017).

There are several compelling reasons why researchers are predicting a dramatic increase in the prevalence of osteoarthritis in the coming decades. One is because the condition is associated with advancing age, and, with people in Western countries living longer than ever, the number of elderly people at risk for osteoarthritis is expected to increase. Added to this is the number of young and middle age people who are overweight, because obesity can be damaging to the joints. A third reason is the large number of people who have suffered injuries, which can also increase their risk of OA (Hunter & Bierma-Zeinstra, 2019).

OA commonly affects the joints of the knee, hands, feet, spine, hip and shoulder. It is also known as degenerative arthritis due to the deterioration of the cartilage in joints it causes. These changes usually occur slowly and worsen over

time. Due to the breakdown in cartilage, joints begin to rub together causing pain, stiffness, swelling and limitation of movement.

The economic burden of OA is substantial and includes drug cost, office visits, viscosupplementation, and joint replacement surgery. The number of hip and knee replacement surgeries performed is projected to continue increasing at a rapid rate: between 2005 and 2030, hip arthroplasties are expected to increase by 174%, and the number of knee arthroplasties is expected to increase even more rapidly: increasing by 673% by 2030 (Wittenauer, Smith, & Aden, 2013).

# CHAPTER I

## EPIDEMIOLOGY OF OSTEOARTHRITIS

Osteoarthritis is the leading cause of disability in America, affecting persons of all ages, sexes and races (Arthritis Foundation, 2017). There are two main forms of OA: primary OA and secondary OA.

Primary OA is a chronic degenerative disease related to aging. Although not caused by aging, as a person ages the water content in the cartilage decreases, making the joint less resilient and more at risk to degeneration. There is believed to be a genetic factor involved as well.

Secondary OA begins earlier in life, usually resulting from a specific injury or trauma, repetitive motion injury, or comorbidity of diabetes or obesity. Since the presenting symptoms are the same, i.e., joint pain and stiffness exacerbated by use or exercise, statistically the two conditions are not generally reported separately.

Osteoarthritis affects women more than men and it occurs with greater frequency as people age. One in two adults will develop symptoms of knee OA during their lives and one in four adults will develop symptoms of hip OA by age 85. (Arthritis Foundation, 2017). Symptomatic knee OA, for example, occurs in 10% of men and 13% of women aged 60 years and over. This number is likely to increase due to the aging population and the national obesity epidemic. (Zhang and Jordan, 2010).

OA is not limited to the United States or the West. Globally, 9.6% of men and 18.0% of women over age 60 years have symptomatic arthritis. Osteoarthritis is the most common form of arthritis in both developed and undeveloped countries and may lead to severe disability in developing countries, placing an enormous burden on their communities (Wittenauer, Smith & Aden, 2013).

As the proportion of the population worldwide over age 60 is projected to triple by the year 2050, accounting for 20 % of the population (Wittenauer, Smith, & Aden, 2013) and noting that obesity (a BMI greater than or equal to 30) affects about 13% of the world's adult population, OA is likely to become a great, global public health concern in only a few decades (NIH, 2010).

Although there is no definitive data regarding race prevalence for osteoarthritis overall, research has found that both the prevalence and types of OA varies among racial and ethnic groups. Both hip and hand OA were much less frequent among Chinese in the Beijing Osteoarthritis Study than in whites in the Framingham Study, but Chinese women in the Beijing Osteoarthritis Study had significantly higher prevalence of both radiographic and symptomatic knee OA than white women in Framingham Study.

Results from the Johnston County Osteoarthritis Project have shown that the prevalence of hip OA in African American women (23%) was similar to that in

white women (22%), and prevalence was slightly higher in African American men (21%) than that in white men (17%). Interestingly, prevalence of individual radiographic features of hip OA varied between African Americans compared with Whites. For example, superior joint space narrowing and osteophytes at lateral compartment are more common in African Americans than for Whites. In addition, African Americans were also more likely to have more severe and tricompartmental osteophytes than their White counterparts. Whether some of these racial/ethnic differences are related to differences in anatomic femoral and acetabular features, shown to be important in radiographic hip OA in whites is worthy of further study. It is believed that Asian have a lower prevalence. There are some studies suggesting a higher prevalence of knee osteoarthritis in African-Americans than Caucasians.

# CHAPTER II

## EARLY ONSET OF OSTEOARTHRITIS

OA tends to occur in older adults, because the cartilage that surrounds the joint wears away over time. But OA can occur at any age. OA which occurs before the age of 50 is called early-onset osteoarthritis (Gosnick, 2021). Like OA, early-onset OA can result from normal wear and tear on the joints, but it is more likely to result from injuries. People who injure their joints directly have a high risk of developing OA within 10 or 20 years of damaging their joint. Early-onset OA can also be triggered by misalignment of the joints, as well as by obesity. Post-menopausal women are also at higher risk, because their bodies stop producing estrogen and estrogen protects bones and joints. The symptoms of early-onset arthritis are the same as for OA: pain and stiffness in the joints, tenderness to the touch, decreased range of motion, and a popping or cracking sound (crepitus) that accompanies movement in the joint (Gosnick, 2021).

# CHAPTER III

## ARTHRITIS RATES

Arthritis strikes at least 1 in 6 adults in every state. In the 15 states with the highest prevalence, arthritis affects up to 1 in 4 adults.

Women have a higher age-adjusted prevalence of arthritis than men in every state. When examined by the same prevalence cutoff points (17.23%–21.54%; 21.55%-23.01%; 23.02%-25.68%; and 25.69%–33.58%), there are only four states in which both women and men are in the highest prevalence group (Kentucky, West Virginia, Tennessee, and Alabama). For the most part, women were in the middle and high prevalence groups, while men are in the lowest prevalence group. In all states, working-age (ages 18-64) US adults face work limitations that they attribute to arthritis. The prevalence of arthritis attributable work limitation varies by state but is generally high, affecting 4.5% to 12.4% of all working-age adults. Pain attributable to arthritis is reported by at least 1 in 9 adults with arthritis in every state. In states with the highest prevalence, it occurs in more than 1 in 3 adults with arthritis. (CDC, 2017).

# CHAPTER IV

## PATHOGENESIS OF OSTEOARTHRITIS

The pathogenesis of OA is complex and involves the interaction of metabolic, mechanical, and inflammatory factors, and not simply the "wear and tear of aging" which ordinary people have blamed for countless decades. These multiple factors, working, together, produce structural damage to the joints (Jones, 2016). It is not a passive destruction of the joint due to rubbing or injury, as some people assume, but an active battle between degeneration and the body's ability to repair itself. In an effort to repair itself, the bone regrows, but regrows abnormally, making the joint worse (Fransen et al., 2015). The joint becomes misshapen, unstable, and painful (Fransen et al., 2015)

During the process, the cartilage does not simply wear away. In reality, the composition of the cartilage in the joint actually changes, resulting in a change in is physical and mechanical properties. Erosions initially occur only on the surface, but deep fissures eventually develop, followed by a series of damaging inflammatory responses. As Hunter & Bierma-Zeinstra (2019) explain, "Proliferating synoviocytes release pro inflammatory products; this process is accompanied by tissue hypertrophy and increased vascularity. In the subchondral bone, bone turnover is increased, and vascular invasion takes place, going from

the subchondral bone and into the cartilage" (p. 1749). The condition is made worse by the abnormal joint movements which result from these processes.

# CHAPTECR V

## COST BURDEN, CAUSES & RISK FACTORS OF OSTEOARTHRITIS

The total costs attributable to arthritis and other rheumatic conditions (AORC) in the United States in 2003 was approximately $128 billion. This equaled 1.2% of the 2003 U.S. gross domestic product. $80.8 billion were direct costs (i.e., medical expenditures) and $ 47.0 billion was spent on indirect costs, such as lost earnings (Ruiz et al., 2013).

The causes of osteoarthritis are unknown. However, several factors have been linked to joint degeneration, including trauma or injury, repetitive motion injuries, activities involving bending or squatting and advanced age.

Several risk factors have been identified, some of which are modifiable. Modifying these risk factor may reduce the risk of OA and prevent subsequent pain and disability.

Those at risk include:

● Any person with joint injury or overuse (such as knee bending and repetitive stress on a joint);

● Age—The risk of developing OA increases with age;

● Gender—Women are more likely to develop OA than men, especially after age 50. They also are more likely to have more severe OA The definite increase in OA in women around the time of menopause has led investigators to hypothesize that hormonal factors may play a role in the development of OA (NIH 2010);

● Being obese—Extra weight puts more stress on joints, particularly weight-bearing joints like the hips and knees;

● Genetics—People who have family members with OA are more likely to develop OA. People who have hand OA are more likely to develop knee OA;

● Race— Some Asian populations have lower risk for OA;

● Diet-Dietary factors are the subject of considerable interest and research in OA.

Protection against knee OA progression has been reported in older men and women with both high dietary vitamin D intake as well as those with high serum levels of vitamin D (Cooper, Edward and Litwic, 2013).

# CHAPTECR VI

## PREVENTION OF OSTEOARTHRITIS

There are several steps individuals can take to minimize the risk of developing OA. The focus should be primarily of weight control, avoiding overuse injuries and impact injuries and maintaining proper body alignment. While biochemical markers are showing promising for diagnosing OA, there is still no definitive biomarker for diagnosing OA. Diagnosis is based on physical examination, review of symptoms, x-rays and laboratory tests by a physician (CDC, 2017; Wittenauer, Smith, & Aden, 2013).

Secondary Prevention: Early diagnosis is the key for effective and appropriate interventions for minimize health consequences of OA (Bruyère, Cooper, Arden, Branco, Brandi, & Herrero-Beaumont, 2015).

Tertiary Prevention: The focus of tertiary prevention is minimizing complications once the disease has been diagnosed. Research in ongoing. One investigation that is ongoing, primarily funded by the Centers for Disease Control since 1991, is the Johnson County Osteoarthritis Project. This is a unique, community-based, longitudinal study of approximately 3,200 rural white and African American residents aged 45+ years. It is conducted by the Thurston Arthritis Research Center (TARC) at the University of North Carolina (UNC)

School of Medicine. TARC originally designed this project to determine racial differences in the prevalence, incidence, and risk factors associated with the occurrence and progression of hip and knee osteoarthritis (OA), the most common and disabling types of arthritis.

Results of these projects will create a better understanding of how and why these conditions occur and what modifiable risk factors can be targeted to reduce their effect.

# CHAPTECR VII

## TREATMENTS OF OSTEOARTHRITIS

A recent systematic review (Fransen et al., 2015) found that almost any program of exercise that increased muscle strength and improved overall fitness and health could significantly reduce the pain associated with OA. People who participated in supervised or group programs of strength-building and aerobic fitness showed the greatest improvement. While all forms of exercise are beneficial to some degree, programs that emphasize flexibility, like Tai Chi, are less helpful.

Another popular treatment for which there is good supporting evidence is injections of Hyaluronanic acid, a component of synovial fluid (Bellamy, Campbell, & Welsh, 2006). Studies have shown that Hyaluronanic acid injections reduce pain and increase mobility by allowing the joints to move more freely, but the procedure is only recommended as a last resort. The beneficial effects of these products last longer than the effects of corticosteroids and there are no serious, long-term complications or adverse effects associated with them, but researchers warn that the quality of these products vary widely and, depending on the product injected, patients may or may not see the benefits reported in the literature (Bellamy, Campbell, & Welsh, 2006).

For patients for whom exercise is out of the questions, there are alternative, natural therapies to consider. Researchers may disagree on their effectiveness, but most are convenient, free or cost very little, and generally known to be safe (Melvin, 2020). One is turmeric. One of its components, curcumin, is believed to relieve pain and reduce inflammation. Turmeric is a spice derived from a plant related to ginger. As a spice, it is an important ingredient in curry dishes, but most foods do not contain enough turmeric to reduce the symptoms of OA. To get the full benefits of turmeric, people have to take supplements which contain concentrated levels of the spice. Supplements are inexpensive and readily available, but they are not recommended for pregnant women (Melvin, 2020).

Some OA sufferers use cannabidiol (CBD), a component of marijuana which has been shown to relieve pain and reduce inflammation. CBD products are marketed in a number of forms, including tinctures, ointments, and pills. The problem with CBD products is that they are not regulated by the government, so consumers can never be really sure of the purity and safety of what they are taking (Melvin, 2020).

Massage has also been shown to be useful, but only in relieving pain, and the research supporting the use of massage is limited and inconclusive (Melvin, 2020). In addition, the mechanism by which it works is not well understood. Some researchers believe it improves circulation, while others believe that its benefits are

due to lowered blood pressure or decreases in muscle tension (Melvin, 2020). While many therapists are licensed to perform massages, not all of them are trained to treat patients with OA.

Another popular alternative approach to pain relief is acupuncture. It is one of the oldest treatments for pain, but it is also the least understood of all the alternative treatments for OA (Melvin, 2020). It is based on a religious belief that there are channels within the body through which energy flows, and that illnesses develop when that flow is blocked. While there is no scientific evidence that these channels exist, there is a great deal of evidence that acupuncture can relieve pain. It is generally considered safe, but its safety and effectiveness depend on the skills of the acupuncturist, so it is best to choose a fully licensed practitioner (Melvin, 2020).

Closely related to acupuncture is tai chi, an ancient form of exercise that incorporates slow, relaxing, deliberate movements. It is known to reduce pain and stiffness and improve balance, which is good for older people at risk for falling. It is generally considered safe for everyone, can be performed anywhere, alone or in a group, and can even be practiced sitting down (Melvin, 2020).

# CHAPTECR VIII

## THE MYTHS OF OSTEOARTHRITIS

One of the myths of OA is that it is a normal part of the aging process (Griffin, 2019). OA is not normal, although it is common. And while it is true that the body wears down as it ages, OA is not the same as wearing down. “Wear and Tear” cannot explain the damage done by OA (Griffin, 2019).

Closely related to the myth of “wear and tear” is the myth that OA is a normal part of aging (Griffin, 2019). While it occurs more frequently in older adults than in younger ones, it is not a normal part of aging. Many people go through their entire lives and never develop OA, while many young people get it, long before the aging process has had time to wear out their joints. Even teenagers can get it (Griffin, 2019).

The myth that OA is a normal result of aging has led to the mistaken belief that there is nothing people can do to prevent it. In reality, there are several things that people can do. One is to lose weight, because excessive weight burdens and wears out the joints. While the type of foods which people choose to eat may not directly affect their joints, the amount of food they eat certainly will. People can also prevent OA by exercising and strengthening their muscles. They can also prevent

OA by being more careful and avoiding injuries. It has been estimated that 10% of cases of OA are the result of injuries (Griffin, 2019).

A fourth myth is that the best way to treat OA is to avoid using the affected joint (Griffin, 2019). OA is not caused by rubbing or erosion, so not using the affected joint will not make the joint better. In fact, the opposite is true. Exercising strengthens the muscles that support the joint, reduces stiffness, and increases the joint's range of motion (Griffin, 2019).

A fifth myth is that OA is not a serious health problem. If, by serious health problem, people mean one that is life-threatening, they are right, but OA can be a serious problem in other ways. It can be extremely painful, disabling, and disfiguring, and have a significantly damaging effect on an individual's quality of life (Griffin, 2019).

# CONCLUSION

Osteoarthritis is a chronic health condition that is increasing in prevalence nationally and worldwide. It is a public health concern due to the fact that the prevalence is projected to increase significantly as a result of the aging of the global population and the current epidemic of obesity, coupled with the fact that there is no known cure for the disease. Public health efforts aimed at obesity prevention and injury prevention are underway nationally and at the local levels. The CDC currently funds twelve state arthritis programs with the following goals:

(A) to strengthen partnerships with other chronic disease programs, state Arthritis Foundation chapters/regions, and other partners, improve their ability to monitor the burden of arthritis in their state,

(B) to coordinate activities to increase public awareness that something can be done to address the burden and impact of arthritis, and (C) to Expand efforts to promote self-management education and physical activity to adults with arthritis (CDC, 2017).

More research is needed to find better diagnostic tools and medicines targeted at reducing or reversing the damage caused by OA, in order to ease suffering and reduce the economic burden of OA in the U.S. and throughout the world (Wittenauer, Smith & Aden, 2013). Currently, the best approach to preventing OA

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