

## The Effect of Dietary and Exercise in Obesity and Overweight as Protecting Factor of Osteoarthritis

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### ARTICLE INFO

### ABSTRACT

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Osteoarthritis (OA) is a major global public health issue. It can be harmed the knee, hands, hip, and spine joints. Overweight and obesity are the main risk factor for osteoarthritis. Weight loss and exercise are needed to reduce the adverse effect of osteoarthritis. This review is purposed to find out if dietary or exercise or both are effective to reduce the symptoms of osteoarthritis. The review uses searching literatures method that has been derived from PubMed database. Inclusion criteria and exclusion criteria were using to filtered the proper articles. The results discovered that weight loss are effective for osteoarthritis patients with higher BMI, it minimises the knee's compressive pressures and prevented the progression of the maximum and mean extrusion lengths. The exercise can help avoid inflammation in OA. For both non weight bearing quadriceps improving exercise and weight bearing functional activity enhanced the results of pain and function over a 12-week period. Some studies suggest that combination of dietary and exercise might help to improve quality of life in OA patients. The Intensive Diet and Exercise for Arthritis (IDEA) lowering knee pain significantly and also improving in clinical results. We concluded that combination of exercise and dietary as recommended non pharmacologic treatment of osteoarthritis. Though in some aspect dietary only may give advantages to OA patients with overweight or obesity.

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### 1. INTRODUCTION

The Rheumatic Musculoskeletal Disorder osteoarthritis (OA) is a major global public health issue, it influenced 240 million humans around the world in 2017, whereas it happened to 18% female and 10% male above 60 years. In 2019, it affected 303 million humans globally, bringing significant morbidity along with it, including disability and lowered quality of life, and causing fatality.[1], [2] The osteoarthritis has become more prevalent in recent years as a result of the combined effects of an ageing and growing obese the numbers of people.[3] Any joint can be harmed although the knee, hands, hip, and spine are most frequently impacted.[2] There are some risk factors for osteoarthritis (OA) such as older age (particularly 55 and older), higher body weight, prior joint damage, and heredity are all recognised risk factors for OA, especially for obesity, is a main risk point of OA.[4], [5] It is generally recognised that getting overweight places a mechanical strain on weight-bearing joints, elevating the risk of OA.[6] In contrast to people with a BMI under 25, obesity rises the lifetime chance of developing manifestations of OA.[7]

Prevalence of osteoarthritis in some countries vary, it estimates range from 4.9 to 36.8% in the Africa region and between 1.4 to 83.7 in South Asia, and between 3% to 57% in the East Asia Pacific region.[8] In recent years, osteoarthritis is highly prevalent in Indonesia, affecting 12.7% of women and 15.8% of men.[9] It has been observed that meniscus pathology, such as meniscal lesions (tears) and extrusion, is linked to the occurrence of osteoarthritis. Meniscal lesions, which are crucial in spreading mechanical stress between the distal femoral and proximal tibial cartilage area in knee osteoarthritis, have been associated to an increased body mass index (BMI), based to research.[5] Osteoarthritis is a musculoskeletal disorder that primarily affects elderly individuals. It also the fourth

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most common cause of morbidity in the elderly.[10] The large burden of disease brought the Osteoarthritis Research Society International (OARSI) to submit a White Paper describing Osteoarthritis as a Serious Disease in 2016. Furthermore, there are a number of risk and benefit aspects with the present OA treatments.[2]

Nociceptors within the OA joints can be stimulated by a number of noxious substances, such as physical or chemical substances like prostaglandin E2 and bradykinins. In fact, various kinds of receptors found on nociceptors that transmit noxious stimulus into pain but the transient receptor potential (TRP) family is likely most well characterised, with transmembrane domains that function as ion channels upon stimulation.[11] For normal circumstances, nociceptors, which consist of medium in size myelinated A delta fibers and slow-conducting smaller unmyelinated C fibers, are only stimulated by unpleasant stimulus. In conditions that are pathological, including inflammation, changes in the mechanism of pain cause hypersensitivity, causing painful stimuli generate hyperalgesia while harmless stimuli like light touch, will be perceived as allodynia.[12]

Weight loss and exercise treatments have been shown in clinical trials to reduce pain and improve function in overweight and obese persons with complaints of OA.[4] According to the Intensive Diet and Exercise for Arthritis (IDEA) test, weight loss through diet and exercise significantly decreased knee OA symptoms and promoted function.[5] This article is aimed to find out whether dietary or exercise or both are effective to reduce the symptoms of osteoarthritis.

## 2. METHODS

This article is a narrative literature review which describes about osteoarthritis and its correlations with dietary and exercise on obesity or overweight. The reviewed articles has been taken from PubMed database. The first step we use keyword “obesity”, “obese”, ”overweight”, “dietary”, “dietary weight loss”, “exercise”, “osteoarthritis”, “risk of osteoarthritis” in searching the articles. The second step we determined the inclusion criterias of this review, journals that were published in last five years (2018-2023), study design randomized control trial, and free full text articles. The exclusion criterias were articles with the treatment by pharmacologic drugs and article is not matched with title and abstract. Last step is reviewing the articles based on objective and topic of the research.

## 3. RESULTS AND DISCUSSION

Based on searching articles from PubMed database we found 17.321 articles, after screening based on inclusion criteria we found 137 articles. Finally, in last screening article matched with title and abstract we found 8 articles that eligible to be reviewed. Meniscal damage is a leading cause of limited functioning in the knee. The meniscus is an important structure in the knee joint for physiological and anatomical reasons.[13] A high body mass index (BMI) significantly reduces life expectancy and affects years lived with a disability. Overweight (BMI of 25-29.9 kg/m<sup>2</sup>) and obesity (BMI  $\geq$ 30 kg/m<sup>2</sup>), respectively, have been identified as potential adjustable risk indicators for the development and growth of osteoarthritis.[3] Study of Munugoda et al discovered that lowering weight was correlated with a decrease in the maximum and mean extrusion distances of the medial meniscus beyond 18 months. Higher BMI was found to have greater an impact on the medial compartment of the knees with normal posture than the lateral compartment. A strong correlation between weight reduction and slower progression for maximum and mean extrusion distances was seen in the medial meniscus over time. An expected explanation for this link is that weight loss minimises the knee's compressive pressures, which may have prevented the development of the maximum and mean extrusion lengths.[5]

Regular exercise can help avoid inflammation, loss of subchondral and metaphyseal bone trabeculae, and cartilage degeneration. Regular exercise can help patients with knee osteoarthritis improve their joint dysfunction, stiffness, pain, and muscle weakness.[14] The outcomes demonstrated that over a 12-week period, both Non Weight Bearing quadriceps improving exercise and Weight Bearing functional activity enhanced the main results of pain and function in a comparable manner. There was evidence, though, that some additional results might advantages more from Weight Bearing exercise than from Non Weight Bearing exercise.[15]

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Exercise and dietary programme combined lowering knee pain significantly more than either programme solely, based on The Intensive Diet and Exercise for Arthritis (IDEA).[16] In line with it, the study of Jiang et al also reported that the combination of dietary and exercise approach should continue to be the treatment of preference as it is anticipated that most patients who are assigned to it would see the best improvements in their clinical results, including Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) function, stiffness, and pain scores, also Photographic Chondropathy Score (PCS), and weight loss from starting point.[4] Messier et al said that compared to either intervention independently, dietary and exercise combined significantly enhanced gait speed through a significantly longer length of stride and a quicker cadence. Given that increased gait speed is related to longer lifespans according to epidemiologic data, this may have significant long-term health implications. In comparison to the exercise group, the dietary plus exercise combined groups made tibiofemoral compressive impulse and vertical and anterior stopping ground reaction force were significantly smaller. Still, compared to the exercise intervention, joint loads were significantly reduced by the exercise and dietary combined interventions.[17]

Exercise and weight loss are non-pharmacologic interventions that affect belief in oneself and improve quality of life for people with knee osteoarthritis. Mihalko et al found that the dietary and exercise group reported notably ( $p < 0.05$ ) greater belief for walking duration, balance, and gait compared to the dietary or exercise only groups at 6 months and 18 months. Huge variations between groups were found for all belief in oneself measures. The most effective strategy of therapy for overweight/obese adults with knee OA is a mixed interference of diet-induced weight reduction and exercise. This will increase self-efficacy, enhance physical function, and lessen pain, and also maximise both clinical and patient-centered outcomes that are related to psychological processes.[18] Knee compressive force and plasma IL-6 level at 18 months were the two mechanistic outcomes for which dietary approach was the ideal. For individuals who are heavier, it is probable that sticking to the recommended exercise regimen will be harder.[4]

Research of Hughes et al found that the results at 2 and 6 months showed that exercise and dietary class changes were more effective to exercise class alone in terms of BMI and waist circumference. Furthermore, at two months, diet quality enhanced more in the exercise and dietary class group than in the exercise class only group. Exercise and diet class participants also experienced fewer joint discomfort, enhanced joint mobility, and faster walking velocity compared to common exercise class participants, which is comparable to findings that resulted in greater weight loss. In order to encourage weight loss and enhance the quality of their diets, participants in the exercise and diet class were told to adhere to the USDA MyPlate eating plan's energy restrictions. Because diet quality is linked to less long-term weight gain, weight loss, and reduced systemic inflammation that balances weight loss, we chose to concentrate on this factor.[19]

Messier et al discovered that participants with knee osteoarthritis who underwent 1.5-year diet and exercise interventions, either combination or in individually, showed statistically significant decreases in BMI, body weight, pain, and improvement in function 3.5 years after the interventions conclusion for each group. The dietary group had significantly reduced BMI and body weight than the exercise group at the 5-year follow-up. Subjects in the dietary group continued to show progress in pain and function five years after beginning assessment. The dietary group also kept their mean weight loss of 5.8 kg (6%) which led to a 2 kg/m<sup>2</sup> decrease in BMI from the beginning and a waist circumference that was 6 cm smaller in size.[16] In other hand, diet and exercise caused an objectively significant but slight difference in knee pain over the course of 18 months among patients with knee OA and overweight or obesity compared to a control group.[20] In contrast to either intervention alone, we predicted that weight loss through diet and exercise would have the biggest overall impact on gait mechanics. But dietary weight loss resulted in the greatest load reductions at the knee, ankle, and hip.[17]

#### 4. CONCLUSION

Weight loss programme may give more benefits to participants who suffered knee osteoarthritis with overweight or obesity, because its effect to lowering mean extrusion in medial meniscus. One of

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the effective weight loss and exercise programme is IDEA that giving repairment in WOMAC pain, stiffness, and function scores, it enhanced gait speed and quicker cadence and reduced compression force on the ground. Combination of exercise and dietary as recommended non pharmacologic treatment of osteoarthritis. This combination can lowering BMI for obese people, reducing load at knee, ankle & hip joints and led to relieve pain in OA patients.

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