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Exercise interventions in Knee Osteoarthritis in Aging adults: A Systematic Review of Randomized Clinical Trials

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ABSTRACT

The objective of this study is to reproduce evidence to distinguish the different forms of exercises most applicable in clinical practice for aging adults who are suffering from osteoarthritis of the knee joint. Knee osteoarthritis is one of the most common degenerative diseases causing disability in an elderly individual. Osteoarthritis is an increasing problem for aging people. Among many treatment strategies, Exercise is recommended as a first-line conservative intervention approach for Osteoarthritis. A wide range of exercise programs are available and scientific evidence is necessary for advising patients with OA on the optimal treatment strategy. So, reviewing literature for this condition is noteworthy. A computerized literature search of MEDLINE, CINAHL, EBSCO, and PUBMED was carried out. Randomized clinical trials on exercise therapy for OA of the knee in geriatric populations were selected. Two authors individually selected the studies and a third author was referred for an additional opinion.

Conclusion: There is evidence of the beneficial effects of exercise therapy in patients suffering from OA of the knee. However, the lesser number of good studies limits drawing firm conclusions.

Key Words: Exercises, Physiotherapy, Knee osteoarthritis, Randomized controlled trial, Systematic review

INTRODUCTION

Osteoarthritis (OA) is the leading cause of the functional decline and morbidity in the elderly.¹ It is also associated with significant pain, and economic burden, restricted basic daily activities, and quality of life.²⁻⁴ According to data from 2013 to 2017, at least 29 million Indians have OA.^{5,25} Over the next few decades, substantial rises are expected in the incidence, health impact, and economic consequences of OA, largely due to the aging of the population and the second reason is obesity epidemic⁶⁻⁷. Older age and Excess body weight and other systemic diseases are well-recognized risk factors for the development of OA, especially knee OA. The burden of knee OA alone is particularly high and is on the rise.^{8,9} Therefore; it is of paramount importance to keep updating OA management guidelines so as to provide the best possi-

ble evidence-based management in the primary setting. This may help to delay progression into end-stage OA and thus decrease the need for arthroplasty and alleviate post-surgical complications.^{10,11} Treatments available for OA include pharmacological therapies, intra-articular injections, surgical procedures, and conservative interventions, such as physical therapy, braces and devices, and exercise.^{11,12,13,20} In this review we are going to focus on physiotherapy management of OA which is non-surgical as well as cost-effective. The presence of an evidence-based treatment approach helps in accurate and precise management of OA knee. So, the aim of the present study was to find out the best treatment strategies according to recent research in the field of physiotherapy. Here, we have discussed the effectiveness of exercise programs by type of exercise and severity of OA in Aging adults.¹²⁻¹⁵

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MATERIALS AND METHODS

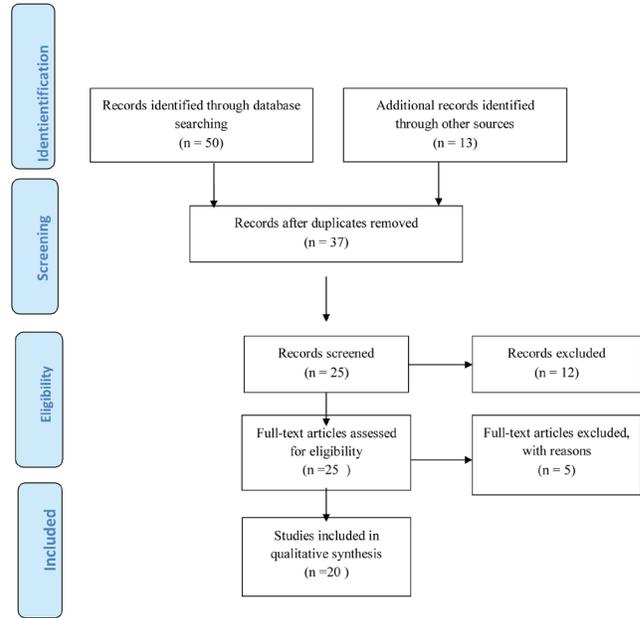
A literature search of publications from the past 5 years (January 2015 through July 2019) was conducted within Pubmed/Medline, EBSCO, Google scholar and the Cumulative Index to Nursing and Allied Health Literature using the terms osteoarthritis, exercise, exercise program, effectiveness, and treatment outcome. Although systematic reviews were not used for this article. Full-text available RCTs and abstracts were reviewed for identified articles by 2 of the authors to determine if they were specific to OA, had a clearly defined exercise program, and examined the effectiveness of the program. English-language RCTs of exercise programs for OA were included, and pharmacological and surgical intervention studies of OA (such as total joint replacement) that included exercise programs were excluded. The full text was obtained for articles that met these criteria. The initial search strategy identified 50 potentially relevant publications. Duplicates (13) and articles that did not meet inclusion criteria after examining titles and abstracts (12) or reviewing the full text (25) were removed, leaving 20 RCTs included in this review.

Criteria for studies considered for inclusion. Trial reports that met the following criteria were eligible. 1) The trial concerned patients with OA of the knee, and this was assessed using either clinical or radiologic criteria (or a combination) for OA. 2) Treatment had been allocated using a random procedure. 3) At least 1 of the treatments had included exercise therapy. Exercise therapy is defined as different types of body movements which help to improve the strength of muscles, range of motion of joints, endurance, balance, coordination, posture, motor function, or motor development of the human body. Exercise therapy can be performed actively, passively, or against resistance.³² No restrictions were made as to the type of supervision and group size. Additional interventions were allowed. 4) At least 1 of the following outcome measures had been included: pain, self-reported a disability, observed disability, and patient's global assessment of effect. 5) The results had been published as a full report. Trial reports were excluded if 1) they incorporated perioperative exercise therapy, or 2) intervention groups received the same exercise therapy and therefore no contrast occurred between the intervention groups. No restrictions were made concerning the language of publication.

Assessment of methodologic quality

A list of specific criteria for the methodologic quality assessment was used, consisting of internal validity criteria, descriptive criteria, and statistical criteria. The internal validity criteria refer to requirements for the design and conduct of intervention research. The descriptive and statistical criteria refer to the external validity of a study.

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RESULTS

Selection of the studies

We initially recognized 50 publications concerning 25 trials that met our inclusion criteria. Five studies were excluded from the review; of these concerned perioperative exercise therapy.¹⁶⁻¹⁹ and 3 did not have a contrast for exercise therapy between the intervention groups.²⁰⁻²² consequently, 12 publications concerning 10 trials were included in our systematic review. The information was combined for 2 trials that were reported twice in the literature.²³ In addition, 1 report that had been accepted for publication was included.²⁴

The methodologic quality of the studies

There was an initial disagreement between the 2 independent reviewers. Disagreement mainly concerned the following criteria: control for co-interventions in trial design, baseline similarity, an adequate description of interventions, and intention-to-treat analysis. Nearly all disagreements were due to reading errors or a difference in interpretation of the methodologic criteria. After the consensus meeting, no disagreement persisted.

Validity criteria

Six trials satisfied at least 6 of the 12 validity criteria. (50% of the criteria)^{9-11,20-25} One trial did not satisfy any of the validity criteria.²⁶ As a consequence of the nature of exercise therapy, neither care providers nor patients can be blinded to the exercise therapy. Thus, the criteria blinding of care providers and blinding of patients were not met in any of the trials studied. The most prevalent shortcomings con-

cerned co-interventions: the design of 3 trials did not control for co-interventions concerning physical therapy strategies or medication and in 8 trials, there was no report of these co-interventions for each group. In 2 trials, bias was likely due to the absence of an intention-to-treat analysis. Many trials lacked sufficient information on several validity criteria: concealment of treatment allocation, the level of compliance, control for co-interventions in the design, and blinding of outcome assessment. Information on adverse effects of exercise therapy and long-term outcome assessment was often missing in trial reports. In 2 trial reports^{27,28} long-term follow-up was mentioned, but no results were presented.

Effectiveness of exercise therapy in comparison with placebo treatment or no treatment

The majority of the trials included in this review were designed to study the differences between exercise therapy and placebo treatment or no treatment.⁸⁻¹² One of these trials also aimed to study differences between different exercise therapy interventions.¹⁰⁻¹⁴

The pain was used as an outcome measure in 7 trials. In these trials, 4 different outcome measures were used to assess pain. No information was available on the timing of pain assessment in relation to the days of exercise. In one trial included 2 comparisons between exercise therapy interventions (aerobic exercise and resistance exercise) and a placebo treatment. These trials, however, differed in terms of participants and content of the intervention. In both trials, radiographic evidence indicated a mild-to-moderate stage of the disease.

In both trials, patients were recruited through physicians, and in 1 trial¹⁵ this was supplemented with community-based recruitment. The intervention in 1 trial²⁵ concerned supervised individual therapy, including strengthening exercises, range of motion exercises, and functional training. The other trial¹³ concerned supervised group therapy followed by a home-based program. Exercises included aerobic exercises or resistance exercises.¹⁴ In both trials, the supervised parts of the interventions took 12 weeks to complete. The only trial with acceptable validity, but low power, was borderline significant.⁹ This study concerned patients with knee OA who had radiographic evidence and symptoms (both not specified) and were recruited from a clinical setting. Two 4-week exercise programs were compared: individual weight-bearing exercises and supervised group therapy consisting of non-weight-bearing exercises.

The intervention concerned an 8-week supervised group therapy that mainly consisted of "fitness walking."²² The other studies concerned patients with knee OA according to the criteria of the American College of Rheumatology who were recruited from both the community and the clinic⁸, and patients with knee OA (not specified) who were recruited

in the clinic.¹² The exercise interventions consisted of a 12-week walking program⁷ or an 8-week strength training program monitored on a dynamometer.¹⁵ Thus, the evidence indicates a small-to-moderate beneficial effect of exercise therapy on pain in knee OA and, to a lesser extent, in hip OA. This effect was found in participants with minimal-to-moderate OA who were recruited from both the community and the clinic and were being treated with various types of exercise therapy. Self-reported disability was used as an outcome measure in 6 trials.

It can be concluded that there is evidence for a small beneficial effect of exercise therapy on self-reported disability. This evidence is based on participants with knee OA and, to a lesser extent, those with hip OA. This effect was found in participants with minimal-to-moderate OA who were recruited from both the community and the clinic and were being treated with various types of exercise therapy.

Walking- The most frequently used outcome parameter for observed disability, was assessed in 6 trials. In these trials, 4 different assessments were used. Again, this is probably a biased estimate, due to the forced use of post-treatment scores in combination with a significant baseline difference for walking. In conclusion, the evidence indicates a small beneficial effect of exercise therapy on walking performance.

Patient's global assessment of effect

In only 2 trials, a global assessment of effect by the patient was used as the outcome parameter. These data indicate a medium-to-great beneficial effect of exercise therapy according to the patient's global assessment.

Comparison between different exercise therapy programs

Four trials^{10,15,20,23} explicitly studied the differences between different exercise therapy interventions. The pain was assessed in all 4 trials. Three outcome measures were used. In 2 studies, information was given concerning the timing of pain assessment in relation to the days of exercise. In 1 study²¹, outcome assessment preceded treatment, while in another study¹⁷, the pain was assessed the week following the completion of treatment. Self-reported disability was assessed in 3 trials^{6,15,30} and walking in 2 trials.^{31,17}

In this study, participants with knee OA were recruited from the clinic, and a 4-week supervised hospital-based exercise regimen was compared with a 4-week home-based exercise regimen. There are three exercise interventions were compared: an aerobic walking program, aerobic hydrotherapy, and a nonaerobic program directed to the range of motion. In conclusion, no evidence is available in favor of one particular type of exercise therapy program.

DISCUSSION

In this systematic review, we have summarized the available evidence on the effectiveness of exercise therapy in OA of the knee joint. We assessed the methodology of 10 RCTs. It can be decided that exercise-therapy is effective in patients with OA of the knee. Available evidence indicates positive effects on all considered outcome parameters i.e. pain, self-reported disability, observed disability in walking, and patient's global assessment of effects. These studies indicate smaller effects on disability outcome measures, a small-to-moderate effect on pain, and a moderate-to-great effect according to the patient's global assessment of effect.

Since pain and difficulty in ADL are the main symptoms in patients with OA, exercise therapy seems indicated. However, the size of the effects is modest and needs to be enlarged. Some critical remarks have to be made. These conclusions are based on a small number of good studies. Additionally, trials frequently did not include all appropriate outcome measures as required in our criteria. Therefore, for some outcome measures, the evidence is based on a limited number of studies, especially with regard to observed disability (i.e., walking) and patient's global assessment of effect.

Furthermore, a number of different instruments have been used for the assessment of specific outcome measures. This complicates the comparison for reviews, because of possible underlying differences in validity, reliability, and responsiveness.

The recently published list of aspirant instruments provided by Bellamy²² can be seen as a first step in the accomplishment of standardization of assessment. Moreover, barely any information is available on the long-term effects of exercise therapy. In only 2 publications describing the same trial, long-term effects were reported, and beneficial effects were reported for pain and disability.^{13,17} However, in this trial, exercise therapy was continued to some extent during the entire follow-up period. Therefore, no understanding was gained into the duration of effects after finishing exercise therapy.

This lack of information regarding long-term effects is a significant omission since the clinical impression is that effects disappear over time. Trials comparing the effects of different exercise therapy programs remained inconclusive.^{10,15,21,22} Blinding of providers and patients was absent in all studies. As a consequence of the nature of exercise therapy, blinding of both providers and patients is not possible. Therefore, the blinding of outcome measurement is vital. However, in only half of the trial reports, blinded outcome assessment was explicitly reported. Another potential source of bias was the frequently occurring absence of material on adherence to the intervention. This obstructs the interpretation of a study with negative results. It remains indistinct whether the exercise therapy intervention was ineffective due to the inter-

vention itself or due to the participants' failure to adhere to the therapy. We tried to satisfy the current requirements for systematic review.²⁰⁻²²

We examined studies for their control for co-interventions concerning physical therapy strategies and medication. Recent research, however, suggests that control for health education and social interaction should have been included as well²⁹ we included the results from our own study to provide an overview of all available evidence. This study was reviewed by an independent assessor who was experienced in reviewing musculoskeletal trials; similar review procedures were used. Exclusion of our study, however, would not have changed the conclusions of our review with regard to the effectiveness of exercise therapy.

CONCLUSION

The available evidence indicates beneficial short-term effects of exercise therapy in patients with OA of the knee and, to a lesser extent (less evidence available), Given the limited number of studies available, this conclusion applies to patients with mild-to-moderate OA who are recruited in outpatient settings and the community. Beneficial effects have been found for various types of exercise therapy. Exercise-therapy may be recommended for patients with OA of the knee and also for patients with OA of the hip with a mild-to-moderate stage of the disease. Further research could expand on this recommendation. In the design and conduct of these trials, specific attention should be paid to sufficient sample size, adherence to exercise therapy, controls for co-interventions, blinded outcome assessment, and adequate data analysis including an intention-to-treat analysis. The incorporation of a standard set of outcome measures²⁷ in combination with the adoption of a standard for reporting results²⁴ will greatly enhance evidence synthesis in this area.

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