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Review

Impact of physical activity on health-related quality of life in osteoporotic and osteopenic postmenopausal women: A systematic review

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ABSTRACT

Objective: This meta-analysis included papers which evaluated the effects of physical activity on the health-related quality of life (HRQoL) of osteoporotic and osteopenic postmenopausal women.

Methods: Four English databases were searched for relevant randomized clinical trials (RTCs) published from 1970 to June, 2014. Eligible RCTs which used the Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO) as their outcome measure were selected for inclusion.

Results: Five RCTs were included in the final meta-analysis. The results showed that physical activity produced favorable effects in the HRQoL domains of physical function ($p = 0.001$) and pain ($p = 0.01$), but not in other domains. Compared with a single exercise, combined exercise produced more favorable effects on both physical function ($p = 0.0004$) and pain ($p = 0.02$). Short-term physical activity produced significant favorable results in all general health domains of HRQoL ($p = 0.01$), whereas middle-term physical activity produced significant improvements only in the physical function ($p < 0.01$) domains of HRQoL. Long-term physical activity produced significant improvement only in the pain domains of HRQoL ($p < 0.01$), and only in the physical activity group when compared with a control group.

Conclusion: Only weak evidence supports the notion that physical activity effectively improves the health-related quality of life of osteoporotic and osteopenic postmenopausal

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women. Compared with a single exercise, combined exercise produced favorable effects on both physical function and pain. However, different lengths of exercise produced improvements in different domains.

1. Introduction

As the most common skeletal disorder, postmenopausal osteoporosis (PMO) is caused by accelerated bone resorption and a systemic calcium imbalance resulting from estrogen deficiency induced by menopause [1,2]. Additionally, PMO can result from a pathological process that causes loss of bone mass and micro-architectural deterioration of bone tissue [2]. PMO most frequently presents with clinical symptoms which include loss of physical function accompanied by pain, deformity, and depression [3,4]. In 2005, it was estimated that PMO affected 10 million women world-wide, including 8 million in the United States [5]. Other than specific back pain, the early symptoms of osteoporosis are rarely reported; and thus osteoporosis is rarely diagnosed prior to an initial bone fracture [6].

Until now, osteoporosis has mainly been treated by cautioning the patient to avoid fractures and prescribing various pharmaceutical agents. Currently, calcitonin, bisphosphonates, raloxifene, parathyroid hormone, and denosumab, are approved for treatment of postmenopausal osteoporosis in the United States [7]; however, the optimal duration for taking such agents remains unknown, because the risk benefit ratio associated with of long-term pharmacologic treatment of osteoporosis is unclear [7]. Moreover, the most impressive drugs may be too expensive for purchase by clients and patients in developing countries. Hence, when treating osteoporosis, non-pharmacologic therapies provide a promising and suitable alternative to prescription drugs. Current guidelines for treating osteopenia include a recommendation for physical activity [8]. Moreover, the results of several studies have indicated that regular physical exercise can help to reduce pain in postmenopausal women, reduce the incidence of falls and fall-related injuries, and improve postural stability and mobility [9–12]. However, only a few studies have specifically focused on the efficacy of exercise for increasing the HRQoL of postmenopausal women with low bone mass.

HRQoL is a subset of overall life quality, and includes domains of physical, emotional, and social well-being [13]. As recognized by WHO in 2003, the presence of osteoporosis accompanied by a fracture significantly impairs an individual's HRQoL by greatly reducing physical functioning while producing pain, social isolation, and depression [14]. Thus HRQoL is an important outcome that should be considered when planning physical therapy regimens for osteoporosis patients. A meta-analysis published in 2009 summarized and critically evaluated the effects of exercise on HRQoL in postmenopausal women with low bone mass, and the studies included in that analysis utilized either the Short Form 36 (SF-36) questionnaire or Quality of Life of the European Foundation for Osteoporosis (QUALEFFO) questionnaire to gather data [15]. Two of the RCTs included in that meta-analysis gathered their quality of life data by administering the generic health-related SF-36 questionnaire [15]; however, the use of such generic instruments can harm the validity of results [13,16]. Our meta-analysis, only included RCTs which used a disease-specific questionnaire to examine the effects of physical activity on the quality of life of postmenopausal women with osteoporosis or osteopenia, and these studies included some recent RCTs with results published after August, 2009.

2. Materials and methods

This study was conducted according to guidelines described in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) [17].

2.1. Search strategies

The English databases Medline, Embase, CINAHL, and the Cochrane Central Register of Controlled Trials were searched for relevant clinical studies which had their results published between 1970 and June, 2014. The search strategies utilized are shown in Appendix A. Next, review articles were searched and a snowball search was conducted.

2.2. Selection criteria

Only peer-reviewed reports describing the results of randomized controlled trials (RCTs) were deemed eligible for inclusion in our meta-analysis; however, trial results published in the form of a dissertation were also considered as potential candidates. All included studies were required to satisfy the following criteria:

P (population): The RCT studied postmenopausal women with low bone mass, as diagnosed using WHO criteria for osteoporosis and osteopenia.

I (intervention): In addition to single-muscle strength training, both modern and traditional physical therapy regimens, as well as programs that used Tai Chi (TC) or yoga were included in our systematic review.

C (comparison): Studies with both real exercise activities and sham exercises were included in the systematic review.

O (outcome): All included studies used the European Foundation for Osteoporosis (QUALEFFO) questionnaire and its five domains (physical function, pain, general health, social function, and mental health) as a specific instrument to