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Chronic musculoskeletal pain and function improve with a plant-based diet

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ABSTRACT

Background: Chronic musculoskeletal pain, often debilitating, affects all genders, ethnicities, and age groups. Research suggests consumption of a plant-based diet may improve the status of persons with chronic pain. A diet rich in fruits, vegetables and whole grains has been shown to reduce chronic pain and disability associated with musculoskeletal conditions.

Objective: The purpose of this study was to examine the value of a plant-based diet in the management of chronic musculoskeletal pain and functional limitations.

Method: Fourteen subjects participated in the eight-week study. Baseline evaluation included anthropometric measurements and completion of two self-reported outcome measures: Numeric Pain Rating Scale (NPRS) and the Short Form Health Survey (SF-36). A registered dietitian nutritionist provided a sample menu cycle and education on a plant-based diet. Subjects utilized a phone app to log food intake and receive support from the dietitian. Post data collection included a repeat of the baseline measures and the Patient Global Impression of Change Scale. The sample was small. Twenty subjects began, 14 completed. No comparison group was used. Results should be considered with caution.

Results: The diet intervention resulted in decreased pain and improvement in quality of life. Diet adherence by ten of fourteen subjects was 89% based on completion of food intake records and adherence to allowed foods.

Conclusion: Consumption of a plant-based diet produced positive improvements in chronic pain and function. Interprofessional collaboration between physical therapists and registered dietitian nutritionists, along with other healthcare practitioners, can encourage and promote diet interventions that positively affect chronic pain.

1. Introduction

Certain consumed foods, particularly a diet based on whole foods and plants, provide powerful anti-inflammatory benefits.[1] These anti-inflammatory benefits may act to modulate pain and improve functional loss associated with musculoskeletal conditions. Dewell et al[2] and Ornish et al[3] suggested that a vegetarian diet coupled with exercise and lifestyle modification can decrease chest pain, increase protective dietaryfactors, improve circulation, and decrease dietary factors assumed to promote inflammation and pain. Diet facilitated improvements in circulation could augment treatment of perhaps the most common chronic musculoskeletal condition. Kauppila[4] has postulated that the literature indicates an association between atherosclerosis and low back pain. This systematic review supports the concept that cardiac risk factors such as atherosclerosis may lead to diminished blood flow, causing chronic low back pain and decreased functional abilities.[4]

1.1. Purpose

The question addressed in this research was whether eating a plant-based diet could reduce self-reported chronic pain and improve self-reported function. We examined the value of a plant-based diet in the management of musculoskeletal pain and associated functional limitations. Previous work on this subject has linked plant-based diet consumption to improved status of persons with inflammatory conditions. The project was an interprofessional investigation that may also lead to successful collaborative practice, particularly between physical therapy and nutritional science. The results of this study could direct and support interprofessional management of chronic musculoskeletal conditions, leading to improved quality of care and positive health outcomes.

1.2. Literature review

Diets high in animal proteins and fats have been linked to chronic pain and inflammation.[5,6] A general assumption is that individuals who avoid these products may experience less pain. The prevalence of

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chronic pain or inflammation in people whose diet is primarily plant-based is significantly lower than in those who eat an average American diet.[5] The average American diet, typically meat-based, contributes to acidity levels disrupting pH and triggering an inflammatory response.[6] A plant-based diet, comprised of fruits, vegetables, and whole grains, produces anti-inflammatory responses[7] and persons who consume primarily plant-based diets are typically closer to target weight than are their counterparts who consume a typical American diet.[8] In fact, efforts to reduce obesity have often included vegetarian diet patterns to reduce intakes of high fat and low fiber foods as typical in the average American diet.[8]

Two disease-specific applications of the anti-inflammatory benefits of plant-based diets include rheumatoid arthritis and diabetic neuropathy. Treatment of rheumatoid arthritis (a condition marked by significant inflammation) may be facilitated by dietary intervention.[9] Research from Bunner et al[10] has shown improvements in patients with diabetic neuropathy when they consumed a low-fat, plant-based diet.

1.3. BMI maintenance

Obesity has risen dramatically in the United States since the 1980s and reached a plateau in the early part of the 21st century with approximately one-third of the nation being categorized as obese.[11] This trend is not limited to adults. Flegal et al[11] also observed similar trends in adolescents. Obesity is linked with chronic musculoskeletal pain. Segar et al[12] reported a strong association between body mass index (BMI) and back or leg pain in persons with spinal conditions. Peltonen et al[13] found obese persons to have greater likelihood of musculoskeletal pain leading to work limitations when compared to the non-obese general population in Sweden. Furthermore, when these obese Swedish citizens had surgical treatment to promote weight loss, their musculoskeletal pain was decreased. Tsuritani et al[14] reported that among Japanese women, as BMI increased, so did pain. In this same group, as BMI increased, ability to perform functional activities decreased in no small part due to pain with movement.

A meta-analysis performed by Shiri et al[15] has shown an increased risk of low back pain in people who are overweight and obese. While it is difficult to precisely determine the number of Americans with musculoskeletal joint and back pain, Johannes et al[16] suggested that approximately 31% of Americans 18 years and older claim to suffer from chronic pain or inflammation. The degree to which this pain is a result of obesity is unclear, but it is interesting to note that, according to reports from the Centers for Disease Control and Prevention (CDC): the National Health Interview Survey,[17] more than two-thirds (68.8 percent) of adults are considered to be at least overweight. More than one-third (35.7 percent) of adults are considered to be obese. More than 1 in 20 (6.3 percent) are morbidly obese. Almost 3 in 4 men (74 percent) are considered to be overweight to obese. Evidence is mounting that overweight and obesity are risk factors for lumbar radicular pain and sciatica in both men and women[15] and that there is a dose-response relationship with regard to severity of symptoms.[12,15] Mechanisms associated with the overweight condition as a contributing factor for chronic pain include but are not limited to the degradation of peri-articular cartilage, spinal disc bulges, and an anterior shift in the center of mass resulting in rotational torque placed upon postural muscles.[18,19]

Musculoskeletal pain is often associated with a decrease in physical activity, including activities of daily living (ADL).[20] Musculoskeletal impairments impede function, and, dependent upon the severity of the associated pain, can be debilitating. Empirical evidence suggests that a whole foods, plant-based diet may have health promoting (control of obesity) and even pain alleviating effects (anti-inflammatory).[21]

1.4. Measuring pain and functional loss

The measurement of pain is commonly attempted using self-reported patient questionnaires or rating scales.[22] The Numeric Pain Rating Scale (NPRS) is a clinically employed instrument to document the subjective intensity of pain. The NPRS has an 11-point scale ranging from 0 to 10 with “0” indicating no pain and “10” signifying the most intense pain imaginable. This measurement has been shown to be valid, reliable, and be deemed appropriate for clinical practice.[22]

Improving functional status is a hallmark in rehabilitation. One way of assessing functional status is through the Medical Outcomes Study Short Form Health Survey (SF-36). The SF-36 directly assesses ADL and quality of life while indirectly measuring physical functioning through a universal patient reported outcome instrument. This measurement tool has proved to be valuable in quantifying global health status in numerous conditions including back pain, multiple sclerosis, osteoarthritis, neuromuscular conditions, and musculoskeletal conditions.[23]

1.5. Interprofessional intervention

Interventions that consider and include diet and nutrition could be useful in the management of patients who are suffering from loss of function due to chronic pain or inflammation.[24] The role of the physical therapist in dietary interventions, according to the American Physical Therapy Association, is to screen for nutritional issues and provide general nutrition information to patients and the community.[25] In the study by Black et al[25] > 70% of the participants agreed, when surveyed about health behaviors encouraged by a physical therapist, that the therapist should educate them about maintaining a healthy weight. In addition, nearly a third of the patients wanted advice about nutrition, in particular fruit and vegetable consumption.[25]

Registered dietitian nutritionists (RDNs) are uniquely qualified to provide reliable and evidence-based nutrition education and counseling, whether needed for patients in healthcare settings or for consumers in the community. As part of the interprofessional team, physical therapists and registered dietitian nutritionists, along with other practitioners, can collaborate to encourage and support healthy lifestyle changes and diet interventions that may reduce the prevalence of chronic conditions.[26] It should be noted, however, that the level of patient adherence to therapeutic lifestyle recommendations, typically 50% or less, significantly affects the desired health outcomes.[27]

2. Methods

This study was an eight-week longitudinal quasi-experimental cohort study designed to examine the value of a plant-based diet in the management of musculoskeletal pain and the associated loss of functional abilities. The Arkansas State University Institutional Review Board for Research Involving Human Subjects granted approval before subject participation began (IRB Project 961073-1). Subjects were eligible to enter the study if they met two criteria: Subjects must have been suffering from chronic musculoskeletal pain and be 18 years of age or older. Subjects were excluded if any of the following were present: persons under 18 years of age, already consuming a plant-based diet, taking part in a specialized diet for medical reasons, musculoskeletal pain that was deemed directly part of a systemic disease process, or pain that was judged to be acute in nature. Chronic pain was defined as any musculoskeletal complaint, not part of any ongoing systemic disease process, consistently present for the past six weeks or longer.

2.1. Subjects

Twenty subjects (staff members and students of the university), suffering from chronic musculoskeletal pain as defined in the study, with neuropathic pain being excluded, responded to a digital advertisement (sample of convenience) linked to the local university. All subjects provided written consent and underwent a brief educational training session that detailed the benefits of a plant-based diet, allowed foods, substitution or exchange choices, and the sample menu cycle. The plant-based diet consisted of grains, fruits, vegetables, legumes,