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Gender-Specific Correlates of Complementary and Alternative Medicine Use for Knee Osteoarthritis

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Abstract

Background: Knee osteoarthritis (OA) increases healthcare use and cost. Women have higher pain and lower quality of life measures compared to men even after accounting for differences in age, body mass index (BMI), and radiographic OA severity. Our objective was to describe gender-specific correlates of complementary and alternative medicine (CAM) use among persons with radiographically confirmed knee OA.
Methods: Using data from the Osteoarthritis Initiative, 2,679 women and men with radiographic tibiofemoral OA in at least one knee were identified. Treatment approaches were classified as current CAM therapy (alternative medical systems, mind-body interventions, manipulation and body-based methods, energy therapies, and three types of biologically based therapies) or conventional medication use (over-the-counter or prescription). Gender-specific multivariable logistic regression models identified sociodemographic and clinical/functional correlates of CAM use.
Results: CAM use, either alone (23.9% women, 21.9% men) or with conventional medications (27.3% women, 19.0% men), was common. Glucosamine use (27.2% women, 28.2% men) and chondroitin sulfate use (24.8% women; 25.7% men) did not differ by gender. Compared to men, women were more likely to report use of mind-body interventions (14.1% vs. 5.7%), topical agents (16.1% vs. 9.5%), and concurrent CAM strategies (18.0% vs. 9.9%). Higher quality of life measures and physical function indices in women were inversely associated with any therapy, and higher pain scores were positively associated with conventional medication use. History of hip replacement was a strong correlate of conventional medication use in women but not in men.
Conclusions: Women were more likely than men to use CAM alone or concomitantly with conventional medications.

Introduction

Population-based studies of tibiofemoral radiographic knee osteoarthritis (OA) indicate that 12.1% of U.S. adults > age 60 have symptomatic knee OA.[1] Future increases in absolute numbers of people with OA are likely due to the aging population[2] and dramatic increases in body mass index (BMI).[3] National population estimates suggest that after adjustment for obesity, functional status, and comorbidity, persons with knee OA have significantly higher health care use, an average of 6 more visits to physicians and 3.8 more visits to nonphysician providers per year, relative to persons without OA.[4] Furthermore, population-based forecasts suggest increases in the need for total knee arthroplasty across all adult age groups.[5]

Women are more likely than men to develop OA,[6] with a dramatic increase in incidence around the time of menopause.[7] Population-based estimates of symptomatic radiographic knee OA do not vary by gender, yet women are more likely than men to have radiographic evidence of knee OA and are nearly twice as likely as men to have a larger percentage of joint pathology. A recent review[8] noted that women appear to have thinner knee cartilage with more reduced volume than men; whether women have an accelerated rate of cartilage volume loss than men is unknown.

Women appear to have higher pain and lower quality of life (QOL) measures compared to men even after accounting for differences in age, BMI, and radiographic OA severity.[9–13] For these reasons, women may be more likely to seek effective treatments for pain relief, to minimize functional limitations of symptoms, and to slow disease progression.[14] The use of complementary and alternative medicine (CAM) (including herbal remedies, acupuncture, and such supplements as

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glucosamine and chondroitin sulfate)[15] is common among persons with knee OA,[16] in part because OA is a chronic disease with no cure. Some CAM approaches, such as glucosamine[17] and acupuncture,[18] have been shown to be beneficial in relieving symptoms among OA patients, yet detailed descriptive studies of how specific CAM practices differ between men and women with OA are lacking.

The Osteoarthritis Initiative (OAI) is a multicenter, prospective observational study with the purpose of examining the natural history and identifying risk factors for incidence and progression of knee OA.[19] This data source is unique in that it offers a population with radiographic confirmation of OA. Additionally, the OAI captures detailed assessments of knee-specific pain, QOL, and functional indicators, which permit statistical adjustment for disease severity. Thus, the purpose of this study was to describe gender differences in treatment approaches to manage knee OA symptoms. As our secondary objective, we identified sociodemographic and clinical correlates of therapy choice among men and women.

Materials and Methods

The Virginia Commonwealth University Institutional Review Board approved the study protocol.

Data source and study sample

Publicly available data from the OAI were used (www.oai.ucsf.edu/) (#AllClinical00, V0.2.2). Detailed protocols and specific procedures are described on the study website. Owing to the comprehensive assessments required of participants, the OAI engaged a well-defined community sample to follow longitudinally rather than sampling the overall U.S. population for generalizability. Thus, between 2004 and 2006, 17,457 people completed a telephone screening session, of which 6,450 respondents were deemed ineligible; 30% of the remaining 11,007 potential subjects dropped out before attending an in-person screening interview. Of the 7,686 who attended the screening visit, 23.5% were deemed ineligible (those with rheumatoid or inflammatory arthritis and conditions precluding participation were also excluded), and 13.8% dropped out before enrollment. The final sample that completed the enrollment visit consisted of 4,796 men and women aged 45–79 years. Participants underwent 3.0 Tesla magnetic resonance imaging (MRI) examinations of the knee, provided blood samples, and responded to a battery of questionnaires. Each clinical site had readers (trained by didactic and interactive web-based methods) to assess baseline fixed flexion knee x-rays for osteophytes and joint narrowing. For the current study, we included only 1,563 women and 1,116 men with radiographic tibiofemoral knee OA (Osteoarthritis Research Society International [OARSI] atlas osteophyte grades 1 to 3)[20] in at least one knee at baseline ($n = 2{,}679$).

Evaluating CAM and conventional treatment use for OA

Baseline questionnaires included detailed questions about use of CAM approaches specifically for arthritis or joint pain, as well as how frequently practitioners were seen. Using established criteria,[15] CAM was defined as alternative medical systems (acupuncture, acupressure, homeopathy, and others), mind-body interventions (yoga/Tai Chi/Chi Gong/Pilates, spiritual activities, relaxation therapy, meditation, deep breathing, or visualization), manipulation and body-based methods (chiropractic and massage), energy therapies (copper bracelets or magnets), topical biologically based therapies (rubs, lotions, liniments, creams, or oils, such as tiger balm and horse liniment), capsaicin, biologically based diet, and biologically based supplements (e.g., herbals, glucosamine, chondroitin, vitamins/minerals, methylsulfonylmethane, *S*-adenosylmethionine). Questions included: During the past 6 months, did you use the following health supplements for joint pain or arthritis? with separate questions for chondroitin sulfate and glucosamine.

Data were available about conventional medication approaches to treat OA. Participants were asked: During the past 30 days, have you used any of the following medications for joint pain or arthritis on most days? By most days, we mean more than half the days of the month. There were separate questions for acetaminophen, over-the-counter (OTC) nonsteroidal anti-inflammatory drugs (NSAIDS), prescription NSAIDS, prescription COX-2 inhibitors, doxycycline, and prescription strong pain medications, such as narcotics. Because use of conventional medications was common, a four-level outcome variable that described use of CAM therapies with or without concomitant use of conventional medications was designed. The four categories were (1) CAM use only, (2) conventional medication use only, (3) both CAM and conventional medication use, and (4) no use of CAM or conventional medications.

Sociodemographic and clinical variables

A literature search was conducted to guide decision making about which variables should be evaluated as potential correlates of CAM use and conventional medication use for knee OA. CAM use has been found to be different by age group,[21] race/ethnicity,[22,23] educational attainment,[24] annual household income, employment status, health insurance status, and obesity.[25] BMI was calculated from measured height and weight (kg/m^2). Participants with a BMI between 25 and 29 kg/m^2 were defined as overweight, 30–34 kg/m^2 as obese, and $\geq 35\ kg/m^2$ as morbidly obese.[26] Disease severity was classified by x-ray evidence of joint narrowing, determined as an OARSI atlas osteophyte grade of 1 to 3 on a fixed flexion radiograph.[19] Briefly, the OARSI atlas recorded individual radiographic features, such as osteophytes and joint space narrowing for the knee (medial compartment, lateral compartment, tibial, femoral); it is thought to be an improvement over the Kellgren and Lawrence system by its sensitivity to change over time. An OARSI grade of 3 corresponds to a Kellgren and Lawrence grade of 4. These images were made available in print and electronic formats to assist in evaluating joint narrowing for clinical studies. Presence of OA symptoms in multiple joints was based on self-reported lower back pain in the previous 30 days, OA in the hand, hip symptoms in the past 12 months, history of hip replacement, and history of knee injury or any knee surgery (including meniscal and ligamentous repairs and unilateral total knee replacement).

The OAI used the Medical Outcomes Study Short Form-12 (SF-12) to evaluate general physical health status. Consisting of 12 questions covering eight health domains (physical functioning, social functioning, role-physical, role-

emotional, mental health, energy/vitality, pain, and general health perception),[27] the SF-12 questions were combined, scored, and weighted to create the physical scale and mental health scores, ranging from 0 (lowest level of health) to 100 (highest level). The Center for Epidemiologic Studies Depression (CES-D) 20-item scale[28] evaluated depression status, with a score >16 indicative of clinical levels of depression.

Indicators of symptoms and severity of knee OA included pain, QOL, performance and function, and disease severity. Several scores were evaluated using the measures of the most severely affected knee joint. The pain scale of the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index (version LK 3.1)[29,30] was used to determine pain (maximum score of 20 indicated worst pain). To indicate knee-related QOL, the Knee Outcomes in Osteoarthritis Survey (KOOS) assessed knee symptoms and function during more demanding activities, such as sport and recreation.[26] A score of 100 on the KOOS QOL subscale indicated no symptoms, where as a score of 0 indicated extreme symptoms. A 20-meter walk measured walking ability and endurance[31]; the average duration (in seconds) needed to complete the walk was calculated from two trials. The chair stand test (time in seconds to stand up and sit down five times as quickly as possible) provided a direct assessment of integrated physical performance involving leg strength and knee function.[32]

Statistical analyses

First, the sociodemographic and clinical characteristics of the OAI participants were compared by gender. Absolute differences of 5% were considered to be clinically relevant in the descriptive analyses. We evaluated gender differences in treatment patterns using a polytomous logistic regression with a four-level outcome variable for treatment pattern and a primary determinant of gender (coded as 1 for women, 0 for men). Confounding was evaluated by an iterative approach, retaining variables whose inclusion in the model resulted in an at least 10% change in the gender estimate of effect. The analyses evaluating correlates of treatments were conducted by gender because previous reports suggest that women have worse pain and QOL measures compared to men.[9–13] Thus, factors associated with decisions to use CAM may likely be different for men and women.

Gender-specific polytomous logistic regression models identified correlates of CAM use using the four-level outcome variable (CAM use only, conventional medication use only, and both, with no use of CAM treatments or conventional medications as the reference group). Multicollinearity was evaluated in two ways: before modeling, correlations between the variables of interest were evaluated, and none provided indication of potential multicollinearity; during the modeling process, standard errors (SE) were carefully evaluated when entering new variables in the model to rule out collinearity. Odds ratios (OR) for the SF-12 physical scale, WOMAC pain, and KOOS QOL were calculated for a 1 standard deviation (SD) change in each variable.

Results

Table 1 shows the gender differences in sociodemographic measures and clinical characteristics. More women than men

Table 1. Sociodemographic and Clinical Characteristics of Participants with Radiographically Confirmed Knee Osteoarthritis, by Gender

Characteristic	*Women (n = 1,563) (%)*	*Men (n = 1,116) (%)*
Sociodemographics		
Age (years): ≥65	45.2	40.6
Race/ethnicity		
Non-Hispanic white	73.1	83.6
Black/African American	23.1	13.3
Latino	1.5	1.3
Other	2.4	1.8
Education		
≥College graduate	47.4	66.7
Some college	30.9	19.4
≤High school	21.7	13.9
Income ($):		
>100,000	14.8	30.3
50,000–100,000	33.1	39.5
25,000–50,000	32.3	20.6
≤25,000	19.7	9.6
Married/partnered	55.8	79.6
Working (for pay)	54.2	64.6
Health insurance	96.5	97.1
Insurance covers prescriptions	86.0	88.2
Body mass index (kg/m^2)		
≥35 (morbidly obese)	16.1	10.1
30–<35 (obese)	29.8	30.4
25–<30 (overweight)	33.6	46.5
≤25 (normal)	20.6	12.9
CES-D >16 (depressed)	10.0	8.3
	Mean (standard deviation)	
Weight at age 25 (kg)	60.0 (9.1)	79.0 (11.6)
SF-12 Mental summary	53.5 (8.5)	54.3 (7.8)
SF-12 Physical summary	46.9 (9.8)	48.6 (8.9)
Symptoms		
WOMAC pain	4.3 (4.2)	3.8 (3.6)
KOOS QOL	62.6 (23.5)	62.3 (22.4)
Function and performance		
Chair stands (seconds)	12.2 (4.2)	11.1 (3.3)
20-meter walk (seconds)	16.4 (3.4)	15.3 (2.6)
Joint space narrowing (x-ray evidence of knee severity)	*Percentage*	
OARSI grade 0 (normal)	33.7	25.1
OARSI grade 1–2 (narrowed)	49.3	48.8
OARSI grade 3 (severe)	17.0	26.1
Multijoint osteoarthritis		
Any back pain (30 days)	60.4	55.5
Hand osteoarthritis	23.5	11.3
Hip symptoms (12 months)	28.3	19.2
Total hip replacement	1.9	1.9
History		
History of knee injury	41.8	55.8
History of knee surgery	21.4	41.0

CES-D, Center for Epidemiologic Studies Depression scale; KOOS, Knee Outcomes in Osteoarthritis Survey; OARSI, Osteoarthritis Research Society International; QOL, quality of life; SF-12, medical outcomes study short form-12; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

were African American (23.1% vs. 13.3%). Relative to women, men achieved greater education levels, were more likely to be employed, reported higher incomes, and were more likely to be married. Most participants were insured, and insurance status was similar among men and women. The distribution of BMI varied by gender, with more women in the extreme categories of BMI than men (morbidly obese: 16.1% of women, 10.1% of men; normal weight: 20.6% of women, 12.9% of men). Although KOOS QOL scores were similar by gender, the average WOMAC pain score was slightly higher in women (4.3) than men (3.8). The distribution of OARSI grades indicated women had less joint space narrowing; 17% of women had OARSI grade 3 space narrowing, and 49.3% had OARSI grade 1–2. Among men, 26.1% had OARSI grade 3 space narrowing, and 48.8% OARSI grade 1–2. Women reported a higher prevalence of hand OA (23.5% vs. 11.3% of men) and hip symptoms (28.3% vs. 19.2% of men), although history of total hip replacement was the same (1.9% of men and women). Men were more likely to report both a history of knee injury (55.8% vs. 41.8% of women) and knee surgery (41.0% vs. 21.4% of women); 65% of women and 58.4% of men had both knees affected.

CAM use was common in men and women, with 51% of women and 41% of men reporting CAM use either alone or in conjunction with conventional therapies. Use of multiple CAM methods was common, with 7.6% of men and 12.7% of women reporting use of two CAM methods, and 2.3% of men and 5.3% of women reporting use of three CAM methods. Table 2 shows the specific CAM therapy and conventional medication use stratified by gender. Use of mind-body interventions was reported more commonly by women (14.1%) than men (5.7%). Women were also more likely to report using topical agents (16.1% vs. 9.5% of men). Biologically based supplements were equally favored by men and women

Table 2. Conventional and Complementary and Alternative Medicine Treatments Used Among Participants with Radiographically Confirmed Knee Osteoarthritis, by Gender

Category[a]	*Women (n=1,563) (%)*	*Men (n=1,116) (%)*
Alternative medical systems	1.3	1.0
Acupuncture	0.6	0.7
Acupressure	0.4	0.0
Chelation therapy	0.0	0.0
Folk medicine	0.0	0.0
Homeopathy	0.3	0.2
Ayurveda/biofeedback/energy healing/hypnosis/naturopathy	0.5	0.2
Mind-body interventions	14.1	5.7
Yoga/Tai Chi/Chi Gong/Pilates	7.7	3.0
Relaxation therapy, meditation, deep breathing, or visualization	4.5	2.1
Spiritual activities	5.4	1.8
Manipulation and body-based methods	6.5	3.5
Chiropractic	5.3	3.0
Massage	2.5	0.8
Energy therapies (copper bracelets or magnets)	4.5	2.2
Biologically based therapies: topical agent	16.1	9.5
Rubs, lotions, liniments, creams, or oils (tiger balm/horse liniment)	15.9	9.2
Capsaicin	1.7	1.6
Biologically based therapies: diet	1.2	1.1
Biologically based therapies: supplements	32.5	31.2
Herbs	2.1	1.0
Vitamins/minerals (nearly every day)	7.6	4.5
Glucosamine (nearly every day)	27.2	28.2
Methylsulfonylmethane (MSM)	5.7	5.7
S-adenosylmethionine (SAME)	0.3	0.7
Chondroitin (nearly every day)	24.8	25.7
Conventional treatments		
Acetaminophen	13.1	8.7
Over-the-counter NSAIDs[b]	21.8	20.0
Prescription NSAIDs[b]	8.5	6.4
COX-2 inhibitors	10.5	5.7
Opioids	3.6	1.6
Knee injection	3.3	4.3
Corticosteroid	0.8	1.4
Hyaluronic acid	2.6	3.0
Doxycycline	0.3	0.4

[a]As defined by the National Center for Complementary and Alternative Medicine.
[b]NSAIDs, nonsteroidal anti-inflammatory drugs.

(~32%), with chondroitin and glucosamine the most commonly used CAM approaches. Of conventional medications, women most commonly used acetaminophen or prescription or OTC NSAIDs (43.4% vs. 35.1% of men).

The association between gender and use of treatment approaches is shown in Table 3. Women were more likely than men to use CAM, either alone (crude OR [COR] $_{\text{CAM alone}}$ 1.47, 95% confidence interval (CI) 1.20-1.81) or in combination with conventional medications (COR $_{\text{CAM and conventional medications}}$ 1.92, 95% CI 1.56-2.36). After adjusting for confounding by disease severity, women were still twice as likely as men to use CAM with conventional medications (adjusted OR [AOR] $_{\text{CAM and conventional medications}}$ 2.21, 95%CI 1.72-2.84). Additional analyses showed that multiple conventional medications were also used by men and women; the most commonly combined conventional medications were acetaminophen and NSAIDs (prescription or OTC, 35.5% of women vs. 26.3% of men).

Table 4 shows the correlates of CAM use (with and without conventional medications) for women. Among women, age >65 years was not associated with any treatment preference. Black women were less likely to report use of both CAM and conventional medications compared to non-Hispanic white women. In women, increased educational attainment was associated with use of approaches that included CAM (CAM only: AOR 1.9, 95% CI 1.3-2.9; both: AOR 1.4, 95% CI 0.9-2.1). Compared to normal weight women, women with higher BMI were less likely to use CAM and tended to use conventional medications alone, although CIs were wide. QOL measures and indices of physical function were both inversely associated with use of any therapies (conventional medications only, CAM only, or both), whereas increased pain scores were positively associated with use of conventional medications, either alone or in combination with CAM. Women with a history of hip replacement had 10 times greater odds of using conventional medications (either alone or in combination with CAM). Indicators of multijoint symptoms were generally associated with increased odds of use, with either conventional medications alone (AOR 2.0, 95% CI 1.4-3.0), CAM alone (AOR 1.7, 95% CI 1.3-2.4), or both (AOR 2.6, 95% CI 1.8-3.7).

The correlates of CAM use (with and without conventional medications) for men are shown in Table 5. Black men were less likely to report use of CAM alone (AOR 0.5, 95% CI 0.3-1.0) or CAM with conventional medications (AOR 0.5, 95% CI 0.3-0.9) compared to non-Hispanic white men. A clear gradient between increasing educational attainment and use of CAM approaches was not observed, and there was no discernible relationship between BMI and use of CAM in men. Increased WOMAC pain scores in men were associated with an increased odds of use of CAM with conventional medications (AOR 1.3, 95% CI 1.0-1.7) but not with other treatment approaches (CAM alone and conventional medications alone). QOL measures were inversely associated with any of the therapies used in men. Men with multijoint symptoms had increased odds of use of CAM with conventional medications relative to men without multijoint symptoms (AOR 1.7, 95% CI 1.2-2.6). Men with OARSI grade 3 joint narrowing were most likely to use CAM approaches, either alone (AOR 1.7, 95% CI 1.0-2.7) or with conventional medications (AOR 2.3, 95% CI 1.3-4.0).

Discussion

CAM use is prevalent in people with radiographically confirmed knee OA, but less so among men relative to women. Men in the OAI had more severe knee joint damage than women, and a higher percentage of men than women reported a history of knee injury and knee surgery. Despite these radiographic differences, men and women reported similar outcomes in pain, QOL, and function. Although no differences in the use of conventional medications were observed by gender, men were more likely than women to report use of no treatments (43% vs. 32%). Gender differences were apparent in specific treatment regimens and correlates of CAM approaches.

Women were more likely than men to report use of CAM, either alone or in combination with conventional medications. These findings are similar to those reported by other studies conducted with primary care patients with OA.[33–36] Women were more likely to use biologically based topical agents (e.g., rubs and lotions, including tiger balm and horse liniment), which also has been reported in other studies.[31] Women were more likely than men to engage in mind-body interventions (e.g., yoga, tai chi, and spiritual activities), but no gender differences were observed in the use of chondroitin or

Table 3. Association Between Gender and Using Treatment Approaches Among People with Radiographically Confirmed Knee Osteoarthritis

				Sociodemographic adjusted[a]	*Sociodemographic and clinical characteristic adjusted*[b]
Treatment use	*Women (n=1,563) (%)*	*Men (n=1,116) (%)*	*Crude*	*Odds ratio of women relative to men (95% confidence interval)*	
CAM only	23.9	21.9	1.47 (1.20-1.81)	1.57 (1.27-1.93)	1.86 (1.47-2.34)
Conventional medications only	16.8	16.0	1.41 (1.13-1.78)	1.25 (0.98-1.58)	1.37 (1.04-1.79)
Both CAM and conventional medications	27.3	19.2	1.92 (1.56-2.36)	1.90 (1.53-2.35)	2.21 (1.72-2.84)
Neither	32.0	43.0	Reference group of outcome variable		

[a]Adjusted for age, race/ethnicity, and education.

[b]Adjusted for sociodemographic variables (age, race/ethnicity, education), body mass index ($25 \le BMI \le 29\ kg/m^2$ defined as overweight, $30 \le BMI \le 34\ kg/m^2$ as obese, and $\ge 35\ kg/m^2$ as morbidly obese with referent group of $BMI < 25\ kg/m^2$); depression (CES-D score >16 as depressed with referent group of CES-D ≤16); SF-12 physical scale, WOMAC pain scale, KOOS quality of Life, history of knee injury or surgery, hip replacement, multijoint symptoms, chair stands, and OARSI grade.

Table 4. Sociodemographic and Clinical Correlates of Treatment Use Among Women with Radiographically Confirmed Knee Osteoarthritis (N=1,563)

	Conventional medications only (n=*262*)	*CAM use only* (n=*374*)	*Both CAM and conventional medications* (n=*427*)
	Adjusted odds ratios (95% confidence interval)[a]		
Age ≥ 65 years	1.0 (0.7-1.4)	1.3 (1.0-1.8)	1.2 (0.9-1.6)
Race/ethnicity			
Black/African American	0.9 (0.6-1.4)	0.8 (0.6-1.3)	0.6 (0.4-0.9)
Latino	0.9 (0.2-4.0)	0.2 (0.03-2.0)	1.3 (0.4-4.4)
Other	0.6 (0.2-2.4)	2.1 (0.9-5.1)	0.6 (0.2-1.8)
Non-Hispanic white	1.0	1.0	1.0
Education			
≥College graduate	1.1 (0.7-1.8)	1.9 (1.3-2.9)	1.4 (0.9-2.1)
Some college	1.2 (0.7-1.8)	1.5 (0.9-2.4)	1.3 (0.9-2.0)
High school or less	1.0	1.0	1.0
Body mass index[b]			
Morbid obesity	1.6 (0.8-3.0)	0.6 (0.3-1.0)	0.6 (0.4-1.1)
Obesity	1.5 (0.9-2.7)	0.8 (0.5-1.1)	0.6 (0.4-0.95)
Overweight	1.6 (0.9-2.8)	0.8 (0.5-1.1)	0.6 (0.4-0.95)
Normal weight	1.0	1.0	1.0
Depression[c]	1.2 (0.7-2.1)	0.7 (0.4-1.3)	1.1 (0.7-1.8)
SF-12 physical scale[d]	0.7 (0.6-0.9)	0.9 (0.7-1.1)	0.8 (0.7-1.0)
WOMAC pain[d]	1.4 (1.1-1.9)	1.1 (0.8-1.4)	1.5 (1.2-1.9)
KOOS QOL[d]	0.8 (0.6-1.1)	0.7 (0.6-0.9)	0.6 (0.5-0.7)
History of knee injury/surgery	1.2 (0.8-1.7)	1.4 (1.1-1.9)	1.2 (0.9-1.7)
Hip replacement	10.8 (2.2-53.1)	3.1 (0.5-17.3)	11.0 (2.3-52.2)
Multijoint symptoms	2.0 (1.4-3.0)	1.7 (1.3-2.4)	2.6 (1.8-3.7)
Chair stands	1.0 (1.0-1.1)	1.0 (0.9-1.0)	1.0 (1.0-1.1)
OARSI[e] grade			
Grade 3 (severe)	1.4 (0.8-2.5)	1.5 (0.9-2.5)	1.8 (1.1-3.0)
Grade 1–2 (narrowed)	1.0 (0.7-1.5)	1.2 (0.9-1.6)	1.1 (0.8-1.6)
Grade 0 (normal)	1.0	1.0	1.0

[a]Reference group for the outcome includes patients who did not report use of CAM for osteoarthritis treatment. Adjusted for all factors on the table.
[b]Participants with BMI between 25 and 29 kg/m^2 were defined as overweight, 30–34 kg/m^2 as obese, and ≥35 kg/m^2 as morbidly obese.
[c]The CES-D 20-item scale evaluated depression status (>16 indicative of clinical levels of depression vs. ≤16).
[d]Odds ratios are per one standard deviation change in SF-12 Physical Scale, WOMAC pain scale, and KOOS QOL scale.
[e]X-ray evidence of joint narrowing.

glucosamine. Comparisons of these findings to the OA literature are limited by lack of standardized definitions or clear operational expressions.

To our knowledge, this is the first study to provide gender-specific correlates of CAM use among adults with radiographically confirmed knee OA. Black women were less likely to use CAM with conventional medications relative to white women, whereas black men were less likely to use CAM in general, either alone or in combination with conventional medications. These findings are consistent with previous reports showing that blacks are less likely to use CAM relative to whites.[22,37] Higher BMI was associated with decreased use of CAM in women, but BMI had no association with CAM use in men. Obese adults are less likely to use CAM overall,[24] but interactions by gender have not been noted. The association between history of hip replacement and use of conventional and CAM treatments among women is worthy of note. Although 1.9% of men and 1.9% of women reported a history of hip replacement, this factor was a much stronger correlate of overall treatment use among women relative to men. The extent to which the long-term prognosis may explain this difference was considered, yet evidence from the literature shows men are at increased risk for revision of hip replacement.[38] It is unlikely that the women in the OAI were experiencing worse prognosis post-hip replacement than men. Previous research has shown that although women report worse outcomes than men before surgery (e.g., Harris hip score, WOMAC function, pain, total scores), women had greater improvement postsurgery.[39] Thus, it is unclear why a history of hip replacement is such a strong correlate of treatment use in women in the OAI. Lastly, although pain markers were correlated with treatment options (conventional medication use and CAM use, either together or separately) in both men and women, more factors were associated (e.g., severity, multijoint symptoms, pain scales) with treatment in women.

Relative to men, the women in this study had less severe disease according to radiographic evidence. Most,[13,40,41] but not all,[1] studies have shown that women with OA report worse pain and QOL scores than men. Indeed, this study demonstrated that despite having less severe disease, the women in OAI had similar QOL, pain, and function reports as men. Thus, our findings are consistent with previous reports.

Table 5. Sociodemographic and Clinical Correlates of Treatment Use Among Men with Radiographically Confirmed Knee Osteoarthritis (N=1,116)

	Conventional medications only (n=*178*)	*CAM use only* (n=*244*)	*Both CAM and conventional medications* (n=*214*)
	Adjusted odds ratios (95% confidence intervals)[a]		
Age ≥ 65 years	1.1 (0.7-1.6)	1.0 (0.7-1.5)	1.2 (0.8-1.8)
Race/ethnicity			
Black	1.0 (0.6-1.7)	0.5 (0.3-1.0)	0.5 (0.3-0.9)
Latino	0.6 (0.1-6.0)	1.3 (0.3-6.0)	2.0 (0.4-9.6)
Other	0.8 (0.1-3.9)	2.0 (0.7-5.9)	0.2 (0.03-2.1)
Non-Hispanic white	1.0	1.0	1.0
Education			
≥College graduate	0.7 (0.4-1.2)	1.2 (0.7-2.1)	1.8 (1.0-3.4)
Some college	0.8 (0.4-1.4)	1.0 (0.5-1.8)	1.6 (0.8-3.3)
High school or less	1.0	1.0	1.0
Body mass index[b]			
Morbid obesity	1.5 (0.7-3.3)	0.6 (0.3-1.4)	1.6 (0.7-3.4)
Obesity	1.2 (0.6-2.4)	1.3 (0.7-2.2)	1.2 (0.6-2.2)
Overweight	1.1 (0.6-2.0)	1.1 (0.7-1.9)	1.0 (0.6-1.8)
Normal weight	1.0	1.0	1.0
Depression[c]	1.5 (0.8-2.9)	1.0 (0.5-1.9)	1.0 (0.5-2.0)
SF-12 physical scale[d]	0.8 (0.6-1.0)	0.9 (0.7-1.1)	0.9 (0.7-1.1)
WOMAC pain[d]	1.1 (0.9-1.5)	1.0 (0.8-1.3)	1.3 (1.0-1.7)
KOOS QOL[d]	0.7 (0.5-0.9)	0.7 (0.5-0.9)	0.5 (0.4-0.6)
History of knee injury/ surgery	1.1 (0.8-1.7)	1.1 (0.8-1.6)	0.7 (0.5-1.1)
Hip replacement	1.5 (0.4-5.6)	0.8 (0.2-3.4)	2.0 (0.5-7.7)
Multijoint osteoarthritis	1.3 (0.8-1.9)	1.1 (0.8-1.5)	1.7 (1.2-2.6)
Chair stands	1.0 (1.0-1.1)	1.0 (0.9-1.0)	1.0 (0.9-1.0)
OARSI[e] grade			
Grade 3 (severe)	1.3 (0.7-2.3)	1.7 (1.0-2.7)	2.3 (1.3-4.0)
Grade 1–2 (narrowed)	1.1 (0.7-1.7)	1.0 (0.7-1.6)	1.4 (0.9-2.3)
Grade 0 (normal)	1.0	1.0	1.0

[a]Reference group for the outcome includes patients who did not report use of CAM for osteoarthritis treatment. Adjusted for all factors on the table.
[b]Participants with a BMI between 25 and 29 kg/m^2 were defined as overweight, 30–34 kg/m^2 as obese, and ≥35 kg/m^2 as morbidly obese.
[c]The CES-D 20-item scale evaluated depression status (>16 indicative of clinical levels of depression vs. ≤16).
[d]Odds ratios are per one standard deviation change in SF-12 physical scale, WOMAC pain scale, and KOOS QOL scale.
[e]X-ray evidence of joint narrowing.

Women in the current study, however, report similar pain despite less severe radiographic damage, which may suggest sex-related differences resulting from women having greater sensitivity to pain[42] or more frequent recurrent pain than men.[43] Likewise, men may have adopted different gait strategies than women resulting in reduced pain.[44] Another alternative explanation for our findings is that men underreport pain. Whereas data from investigations of the influence of gender role expectations on self-reported pain support this notion,[45] our data do not permit a more detailed exploration of this possibility.

The clinical implications of this work must be considered. Despite more severe radiographic severity in knee OA, men were more likely to report no treatments for knee OA. There is no cure for OA. Although strong evidence supporting the use of CAM to slow disease progression is lacking, some CAM approaches, such as glucosamine[17] and acupuncture,[18] have been shown to be beneficial in relieving symptoms among OA patients. Understanding why men are forgoing potential relief from OA symptoms is beyond the scope of the current study. However, the gender differences observed in OA parallel what is seen in some other chronic diseases. Although no gender difference in CAM use was observed for people with asthma[46] or HIV,[47] women were more likely than men to report CAM use with a diagnosis of diabetes,[48] inflammatory rheumatic diseases,[49] multiple sclerosis,[50] and cancer.[51] The reasons for gender differences in CAM use are likely multifactorial and may include differences in preference, knowledge, and access to CAM. The OAI provides few data to help understand the reasons for these observed differences.

These data must be considered with caveats in mind. Our data are cross-sectional, and, therefore we were unable to evaluate the temporal sequence of symptoms and treatment. Self-reported information from patients with OA is subject to measurement error.[52] The information in our study regarding use of conventional medications and CAM therapies is based on self-report with either a 30-day or 6-month recall. It is likely that this misclassification was nondifferential and would have diluted any observed associations. Although we observed that women are more likely than men to use CAM, our data do not permit us to judge if this represents overuse of CAM by women or underuse by men.

Conclusions

Men and women with OA use CAM therapies differently but have similar use of conventional medications. Factors associated with use of CAM for men were QOL and pain, whereas sociodemographics, BMI, and pain were associated with women's treatment use. CAM approaches have costs similar to those of traditional medicine[25]; thus, evidence demonstrating the effectiveness of treatment approaches that include CAM[53] or conventional medications[54,55] or both are needed. Given the prevalence of CAM use in knee OA, understanding the reasons that give rise to the differences in CAM use patterns by gender is warranted.

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Disclosure Statement

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