

Original Research Article

Deciphering the relationship between age, body mass index, and knee osteoarthritis: a data-driven approach

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ABSTRACT

Background: Objectives were to assess the correlation between Western Ontario and McMaster university osteoarthritis index (WOMAC) score, age, and body mass index (BMI) in patients with osteoarthritis knee (OA).

Methods: In this cross-sectional study, diagnosed cases of OA using the EULAR diagnostic criteria 2010 were enrolled. The WOMAC score was used to quantify pain, stiffness, and function in individuals with OA knee. Age, gender, and BMI were also recorded.

Results: A total of 108 knee osteoarthritis patients were enrolled in the study, including 40 men and 68 women. The mean age of the patients was 55.92 years, and their average BMI was 27.24 kg/m². The range of the WOMAC score was 3-12, with a mean of 29.3±1.03. The mean WOMAC scores for pain, stiffness, and functional disability score were 4.574 (1-4), 2.60 (0.12), and 22.20 (0.72) respectively.

Conclusions: Functional status was compared in patients with OA knee, and there was a statistically significant relationship between the age of the patients and the degree of functional impairment caused by the OA knee. Additionally, it was shown that there was a significant negative correlation between age, BMI, and total WOMAC score.

Keywords: Activities of daily life, Health related quality of life, Osteoarthritis, WOMAC

INTRODUCTION

Osteoarthritis (OA) is the most common chronic degenerative joint disease associated with cartilage deterioration and joint deformity: joint discomfort and consequent decline in health related quality of life (HRQoL).^{1,2} OA knee one of the most common kinds of OA is one of the leading causes of disability worldwide and associated with substantial morbidity and mortality.^{3,4}

Most OA patients have had significant changes in their activities of daily living (ADL), and 25% have some functional impairment, such as morning stiffness, decreased joint motion, crepitus, and muscle atrophy.⁵

In several earlier studies it was discovered that the severity of OA knee significantly correlated with functional status

and knee pain was considered an independent predictor of impairment.⁶⁻⁹

The purpose of this study was to assess the functional state of patients with OA knee, K1 grade 2 and 3 and the correlation between clinical and demographic data.

METHODS

This cross-sectional study was conducted from July 2021 to August 2023 in the OPD of the department of orthopedics AIIMS, Rishikesh. A total of 108 patients with knee OA were diagnosed by EULAR diagnostic criteria 2010 for classification of OA knee. Includes Men and women aged 45 to 70 years with OA, unilateral or bilateral, with grade 2 or 3 on the Kellgren Lawrence scale, pain score of 1, 2 or 3 intensities as per the WOMAC scale and Karnofsky performance score between 80-90%. Whereas

patients using any assisted device needed for ambulation, patients using prescribed footwear modification, and any intra-articular injection within the last 3 months were excluded from the study.

Data collection and evaluation

The study is based on age, weight, height, gender, education, occupation, and comorbidities were gathered using a structured questionnaire form. The WOMAC score assessed the functional state. Each patient had an in-person interview to complete the questionnaire. The WOMAC is a self-administered health status assessment that assesses function, stiffness, and pain (either separately or together).

The WOMAC has 24 items that are grouped into three subscales:

Pain (5 items)

Walking, climbing stairs, resting in bed, sitting, or standing. Two instances of stiffness: right after waking up and later in the day.

Physical function (17 items)

Using stairs, getting up from a chair, standing, bending, walking, shopping, putting on/removing socks, rising from a lying position, bathing, sitting, using the toilet, heavy and light housework. Each item the patient answers generates a score that is added up to provide an aggregated score for each dimension and a total score (WOMAC index) representing overall disability.^{10,11}

Ethical approval and patient consent

Informed consent was obtained from each participant included in this study. Ethical approval was taken from the institutional ethics committee AIIMS, Rishikesh. The study's goal was described to each participant, and all of the patients agreed to participate.

Statistical analysis

The only factors that followed a normal distribution were age and BMI, while other variables did not. Mean and SD were used in frequency tables, among other descriptive statistics for normally distributed data. When comparing means between 2 sets of normally distributed data, t test was used, and the chi-square test was used for continuous variables. P=0.05/less regarded as significant. SPSS ver 21 was used to do statistical calculations.

RESULTS

A total of 108 patients 68 females and 40 males with OA were included in the study. The mean age was 55.92±0.8 years, and the mean BMI was 27.24±0.4 kg/m². The mean total WOMAC score was 29.37±1.03 (Range 3-12). The mean WOMAC of pain score was 4.574± (1-4), the stiffness score was 2.60±0.12 and the functional disability score was 22.20±0.72 (Table 1). The WOMAC score overall and the patient's age and the severity of their OA knee as determined by the Kallgren-Lawrence scale were positively and significantly correlated. Additionally, it was shown that there was a significant negative correlation between age, BMI, and WOMAC score (Table 2).

Table 1: Baseline demographic characteristics.

Variables	Male (n=75), mean±SD	Female, (n=33), mean±SD	Total, mean±SD	P value
Age (in years)	61.60±8.9	52.77±7.43	50.50±0.68, (45-59), 66.5±6.63, (59-70)	<0.05
BMI (kg/m ²)	26.5±4.2	27.68±4.56	27.24 ±0.4	0.20
Education				
Illiterate	8	15		0.151
Up to high school	10	5		
Above high school	7	9		
WOMAC				
Pain	171	312	4.57±3.26	0.092
Stiffness	90	185	2.60±0.12	
Function	717	1636	22.20±7.55	
Total			29.37±1.03	
Kellgren-Lawrence scale				
Grade II	10	29		0.869
Grade III	15	47		

Table 2: Correlation analysis between age and BMI with WOMAC according to OA grade.

Variables	WOMAC (Pain)		WOMAC (Stiffness)		WOMAC (Function)		WOMAC total	
	Grade II	Grade III	Grade II	Grade III	Grade II	Grade III	Grade II	Grade III
Age (in years)								
R	0.07	0.07	-0.18	0.16	0.01	-0.0	0.01	0.03
P value	0.61	0.57	0.21	0.20	0.90	0.95	0.91	0.76

Continued.

Variables	WOMAC (Pain)		WOMAC (Stiffness)		WOMAC (Function)		WOMAC total	
	Grade II	Grade III	Grade II	Grade III	Grade II	Grade III	Grade II	Grade III
BMI (kg/m²)								
R	0.02	-0.06	0.04	-0.03	-0.07	0.08	-0.04	0.03
P value	0.87	0.63	0.77	0.76	0.62	0.52	0.78	0.80

DISCUSSION

Knee OA is a significant global burden and a leading cause of decreased HRQoL, as well as a substantial financial burden and health risk.¹² This cross-sectional study looked at the association between the clinical and demographic characteristics and the functional status in patients with knee OA.

The results of the present study are consistent with those of earlier ones that found that knee pain, stiffness, and disease duration may impact functionality in OA patients. The age of the patients, their severity of knee OA, and the overall WOMAC score all showed a positive, significant correlation.

Because knee OA is a chronic, degenerative condition that develops as people age, the quality of life for patients with the condition is significantly reduced. One of the main symptoms of OA is the degeneration and loss of the articular cartilage, which is commonly referred to as "wear and tear".^{13,14}

Older women with OA had worse function than younger women, and the medication administration had no positive impact on these patients' functional condition. Studies on various therapy modalities that aim towards improving the function and quality of life for elderly persons must be encouraged in this setting.^{15,16} Previous research has found that people with low educational levels have a lower quality of life and have more symptoms of knee osteoarthritis.^{17,18}

A significant negative relationship between age, BMI, and knee OA HRQoL (Total WOMAC score) was found in the current study. Similar results were found in earlier studies, which found that a lack of education was linked to lower patient quality of life and more symptomatic knee osteoarthritis.

Limitations

Since most patients could not recall their symptoms in the past, it is crucial to consider recall bias. Additionally, because it was a cross-sectional study, we could not evaluate the causal relationship between the factors and the limited sample size.

CONCLUSION

Patients with knee OA had lower functional quality of life. The age of the patients, severity of knee OA as determined by the Kellgren-Lawrence scale, and total WOMAC score

all had substantial positive correlations. In contrast, age, BMI, and total WOMAC score had significant negative correlations.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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