

# The Effect of Benign Joint Hypermobility on Pain, Physical Function and Quality of Life in Patients with Knee Osteoarthritis

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## Research Article

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# Abstract

**Objective:** This study investigated the effect of hypermobility on pain, joint stiffness, physical function, and quality of life in patients with knee osteoarthritis.

**Design:** Sixty-four patients diagnosed with bilateral knee osteoarthritis were included; 42 patients in Group 1 were those with hypermobility and 22 patients in Group 2. There were 40 women and 2 men in Group 1, and 16 women and six men in Group 2 were those without hypermobility. The age, sex, and body mass index of all patients recorded. The WOMAC and SF-36 tests performed on the patients.

**Results:** The average ages were  $51.40 \pm 5.42$  and  $53.36 \pm 4.31$ , respectively, and there was no statistically significant difference. The body mass index was high in the hypermobility group, and the difference was statistically significant ( $p=0.028$ ). Pain and stiffness were higher in the hypermobility group than in the non-hypermobility group in the WOMAC subgroups and total scores ( $p=0.030$ ,  $p=0.002$ ,  $p=0.047$ ).

The non-hypermobility group had better SF-36 social function and pain scale scores. The difference was statistically significant ( $p=0.016$ ,  $p=0.004$ ).

**Conclusions:** Hypermobility aggravates the symptoms of knee osteoarthritis. Hypermobility evaluated in all patients diagnosed with knee OA. A more intense and long-term rehabilitation program should be determined for these patients to prevent injuries and improve proprioception.

## Introduction

Osteoarthritis (OA) is the most common degenerative joint disease commonly seen in weight-bearing joints such as the knee and hip [1]. The etiology of knee OA is multifactorial. The presenting complaint was pain, stiffness, decreased joint range of motion, joint swelling, and crepitation. Diagnosis made according to the clinical diagnostic criteria and clinical and radiological diagnostic criteria of the American College of Rheumatology (ACR) [2]. The Western Ontario and McMaster Universities Arthritis Index (WOMAC) most commonly uses to evaluate disability in osteoarthritis [3]. Benign joint hypermobility syndrome (BJHS) is the range of motion of the synovial joints over the normal range according to age, sex, and ethnic origin without rheumatic disease [4, 5]. Chronic, recurrent micro traumas, impaired proprioception, and increased range of motion (ROM) due to ligamentous looseness cause extra load on the joint cartilage, which causes subluxation and dislocation, and changes in collagen can trigger the development of OA [6, 7]. Both OA and hypermobility are two separate musculoskeletal disorders that affect the quality of life.

This study investigated the effect of hypermobility on pain, joint stiffness, physical function, and quality of life in patients with knee OA.

## Method

# Patients

This study was performed under the ethical standards of the 1964 Declaration of Helsinki. Sixty-four patients diagnosed with bilateral knee OA according to the ACR diagnostic criteria who admitted to the physical medicine and rehabilitation clinic 1 June 2020-31 December 2020 were included. Patients with systemic inflammatory and autoimmune diseases, who had undergone intra-articular knee injection (glucocorticoid, hyaluronic acid) within the last 6 months, had undergone knee surgery, had a history of malignancy, and secondary knee OA were excluded from the study.

The patients evaluated according to the Brighton hypermobility criteria and divided into two groups. Group 1 included those with hypermobility, and group 2 included patients without hypermobility. Age, sex, and body mass index (BMI) of all patients recorded. BMI calculated by dividing the body weight by the square of the height. The WOMAC and SF-36 tests performed on the patients. Results evaluated among the groups.

## Bjhs Evaluation

The Revised "1998 Brighton" criteria uses for diagnosis to BJHS. Brighton criteria were revised, and a broader evaluation as "1998 Brighton" criteria was developed by Grahame et al. Brighton scale. Based on this scale, the presence of 1. two major, 2. Two minor + one major, and 3. Four minor criteria. The presence of BJHS in first-degree relatives and two positive minor criteria is needed for making a diagnosis of hypermobility [8].

## WOMAC

This index consists of three parts. Part A assesses the degree of pain, part B assesses joint stiffness, and part C assesses physical function. For pain grade 5 questions, for joint stiffness, 2 questions, and physical functions, 10 questions ask. Each question was scored from 1 to 5. 1 = no pain, 2 = mild, 3 = moderate, 4 = severe, and 5 = very severe. The scores were determined by adding each section. The total score was calculated as the total score  $\times$  100/96 [3].

## Short Form 36 (Sf-36)

It consists of eight subscales, with a total of 36 items that evaluate physical and mental health. These subscales are physical function (10 items), social function (2 items), physical role restriction (4 items), emotional role restriction (3 items), body pain (2 items), energy (4 items), general health (5 items), and mental health (5 items). A total of 36 questions were scored between 0 and 100. The eight subscales calculate by adding the scores of the determined questions [9].

## Statistical Analysis

SPSS software (version 20.0; IBM Corp., Armonk, NY, USA) used for statistical analysis. Numeric data presented as the mean  $\pm$  standard deviation. The distribution of numeric data evaluated using the Kolmogorov-Smirnov test. When the distribution of numeric data was normal, an independent samples t-test used. When the distribution skewed, the Kruskal-Wallis H test used for comparison. Results with a p value  $< 0.05$ , were considered statistically significant.

## Results

Sixty-four patients were included, including 42 patients in Group 1 (22 patients) and Group 2. There were 40 women, 2 men in Group 1, 16 women, and 6 men in Group 2. The average ages were  $51.40 \pm 5.42$  and  $53.36 \pm 4.31$ , respectively, and there was no statistically significant difference. The BMI was high in the hypermobility group, and the difference was statistically significant ( $p = 0.028$ ) (Table 1).

Table 1  
Demographic data of the study patients

	<b>Group 1</b> <b>(n = 42)</b>	<b>Group 2</b> <b>(n = 22)</b>	<b>p</b>
Age	$51.40 \pm 5.42$	$53.36 \pm 4.31$	0.148
Body mass index	$35.35 \pm 6.87$	$31.99 \pm 4.92$	<b>0.028</b>
<b>Gender</b>			
Female	40	16	<b>0.016</b>
Male	2	6	

The WOMAC values of the patients summarized in Table 2. Pain and stiffness were higher in the hypermobility group than in the non-hypermobility group in the WOMAC subgroup. The difference between groups was statistically significant ( $p = 0.030$ ,  $p = 0.002$ ), and no statistical difference was observed in terms of physical function. A significant difference was observed in the comparison of the total WOMAC scores ( $p = 0.047$ ).

Table 2  
WOMAC comparison between groups

<b>Subscales</b>	<b>Group 1</b> <b>(n = 42)</b>	<b>Group 2</b> <b>(n = 22)</b>	<b>P</b>
<b>Pain</b>	$12.11 \pm 4.60$	$9.36 \pm 4.68$	<b>0.030</b>
<b>Stiffness</b>	$4.71 \pm 1.77$	$3.09 \pm 2.13$	<b>0.002</b>
<b>Physical Function</b>	$38.50 \pm 13.75$	$33.63 \pm 17.44$	0.264
<b>Total</b>	$57.57 \pm 18.22$	$47.05 \pm 22.14$	<b>0.047</b>

The SF-36 evaluation results presented in Table 3. SF-36 Physical function, vitality, mental health, general health perception, emotional role difficulty, and physical role difficulty were not different. The non-hypermobility group had better social function and pain scale scores. This difference was statistically significant ( $p = 0.016$ ,  $p = 0.004$ ).

Table 3  
SF-36 comparison between groups

Subscales	Group 1 (n = 42)	Group 2 (n = 22)	p
Physical Function	42.79 ± 24.90	42.50 ± 25.01	0.964
Role-Physical	29.16 ± 38.22	39.77 ± 39.83	0.303
Role-Emotional	27.46 ± 40.27	39.42 ± 41.95	0.270
Vitality	38.57 ± 16.50	47.14 ± 19.65	0.073
Mental Health	48.61 ± 16.83	56.36 ± 18.39	0.095
Social Functioning	53.35 ± 24.29	68.70 ± 21.78	<b>0.016</b>
Pain	31.60 ± 19.62	48.93 ± 26.04	<b>0.004</b>
General Health	32.50 ± 17.32	41.02 ± 17.40	0.069

## Discussion

We concluded that benign joint hypermobility syndrome increases pain and joint stiffness and decreases social function in patients with knee OA.

Osteoarthritis is an important health problem that causes disability and is the most common degenerative joint disease. The etiology of knee OA is multifactorial. Malalignment, quadriceps muscle weakness, and obesity were the leading causes. Metabolic diseases (hemochromatosis, Wilson's disease, ochronosis), endocrine diseases (acromegaly, hyperparathyroidism, Ehlers-Danlos syndrome, and crystal arthropathy) increase the risk of OA. It divides into primary and secondary subtypes according to etiology.

Primary OA, although its etiology is unknown, is age-related degeneration. Secondary OA consists of trauma, previous joint surgery, congenital and metabolic reasons (rickets, hemochromatosis, chondrocalcinosis, ochronosis, hyperuricemia, hyperparathyroidism, acromegaly, and aseptic necrosis) [10]. Risk factors divide into two categories: systemic and local. Systemic factors include age, ethnicity, gender, genetic factors, bone mass, nutritional factors, and local factors, including obesity, trauma, and impairment in joint biomechanics such as ligamentous laxity, occupational factors, sports, physical activity, and developmental abnormalities [11].

Its prevalence increases with age. It is more frequent in women [12, 13, 14]. It affects 19% of those over the age of 45 years [15].

The presenting and the first complaint were pain. Stiffness, decreased joint range of motion, joint swelling, and crepitation occurred in the next period. Joint tenderness, crepitation, instability, and atrophy of the periarticular muscles, particularly the quadriceps, observe on physical examination. Radiography may have been normal during the early period. Intraarticular narrowing, osteophyte, and subchondral bone changes observe late period. Radiological evaluation stages with the Kellgren-Lawrence classification [16].

The WOMAC index most frequently uses for its effects on clinical and daily life activities [3]. We also used the WOMAC index in our study, and we observed that pain and joint stiffness were higher in the hypermobility group.

Hypermobility is the range of motion of the synovial joints over the normal range according to age, sex, and ethnic origin without rheumatic disease [5, 17]. It is more frequent in Asian races and in women [18]. As age progresses, collagen decreases due to joint stiffness due to biochemical changes in collagen [6, 18].

Chronic, recurrent micro traumas, impaired proprioception, and increased ROM due to ligamentous looseness because extra load on the joint cartilage, which causes subluxation and dislocation, and changes in collagen, can trigger the development of OA [6, 11, 19].

While OA and hypermobility are similarly more frequent in female patients, OA increases with age, while hypermobility decreases with age. In our study, the rate of females was higher than that of males. Although the average age was higher in the non-hypermobility group, the difference was not statistically significant.

The results of studies investigating the relationship between hypermobility and OA are contradictory. In another study, while an inverse relationship observed between knee OA and hypermobility, another study concluded that there was a positive relationship [19, 20].

In a study evaluating joint laxity in patients with knee OA, no relationship found [21]. In another study, hypermobility found to increase the risk of OA [22]. A study investigating the relationship between hypermobility and multiple joint OA did not find any relationship [23].

It concluded that hypermobility increases symptoms more and decreases patients' quality of life with knee OA [24]. We observed similar results in our study. We observed that while it increased pain and stiffness, it decreased social function.

The small number of patients is the most important limitation of the study. Large number of patients and multicenter studies need.

# Conclusions

In conclusion, hypermobility aggravates knee OA symptoms and decrease quality of life That should be evaluating in all patients diagnosed with knee OA. In these patients, a more intensive and long-term rehabilitation program should be determined to prevent injuries and improve proprioception.

# Abbreviations

OA

**osteoarthritis**; ACR:American College of Rheumatology; WOMAC:The Western Ontario and McMaster Universities Arthritis Index; BJHS:Benign joint hypermobility syndrome; ROM:Range of Motion; BMI:Body mass index;

# Declarations

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Not applicable.

**Author contributions:** Study design, patient recruitment and assessments, data analysis and interpretation, drafting of manuscript, and review of manuscript for intellectual content: SS

## Funding

The author received no financial and material support.

## Ethics approval and consent to participate

The study was approved by the ethics committee of Harran University and was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki. Written informed consent was obtained from all the participants.

## Consent for publication

Not applicable.

## Competing interests

The author declares that they have no competing interests.

## Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

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