

# Effects of Home Stretching Exercise on knee Pain and Physical Function in Patients with Knee Osteoarthritis

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## ABSTRACT

**Background and objective:** Knee osteoarthritis (OA) is a common health problem affecting elderly people. Declines in flexibility, and knee joint pain reduce functional ability and contribute to decisions for total knee arthroplasty (TKA). The objective of this study was to assess the effectiveness of home-based knee stretching program on knee pain and physical function in patients with knee osteoarthritis a waiting total knee arthroplasty. **Subjects and Methods:** Twenty patients with severe knee osteoarthritis were assigned into two groups, stretching and control groups. The subjects in the stretching group were instructed to perform home-based knee stretching exercise once a day for about 3 months. While the subjects in the control group were instructed to maintain their current level of physical activity. Knee pain measured by Visual analogue scale, knee range of motion and physical function measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were assessed at baseline and at the date of admission. **Results:** The stretching group showed significant improvements in knee pain (from  $6.43 \pm 1.86$  to  $4.21 \pm 1.09$ , knee ROM (from  $117 \pm 12.13$  to  $126 \pm 11.34$  and over al WOMAC (from  $63.54 \pm 8.87$  to  $51.63 \pm 7.62$ ), while the control group didn't shows any significant differences in all parameters ( $p > 0.05$  for all). **Conclusion:** Home-based stretching exercises have positive effects in reducing knee pain and improvement in knee range of motion and knee function among patients with severe osteoarthritis waiting for total knee arthroplasty.

**Kew Words:** Knee osteoarthritis, stretching, home exercise, knee arthroplasty.

## INTRODUCTION

Knee osteoarthritis (OA) is a growing problem among elderly people, resulting in pain, functional limitations, disability and decreased quality of life leading to lost productivity and increased health care costs<sup>20</sup>. Recent knee OA clinical

guidelines reinforce the importance of non-pharmacological strategies in the management of the condition<sup>2</sup>.

Physiotherapeutic treatment, and particularly exercise, has been part of the management of knee osteoarthritis and is the second most frequent prescribed treatment after oral medication<sup>14</sup>. In knee OA the aim of treatment is to maintain or improve function and quality of life. A variety of exercise programs for knee OA have been described in the literature, there is no evidence from systematic reviews to support one specific type of exercise<sup>12</sup>. The exercises reviewed include range of motion, strengthening, gait training, stretching, and aerobic exercise<sup>9</sup>. Although it is well established that various forms of exercise are effective in reducing pain and increasing physical function in people with knee OA, regular participation in physical activity has been recognized as being beneficial in the management of knee OA<sup>6</sup>.

The need for cost effectiveness throughout the health care system emphasizes the importance of knowing whether patients require numerous visits to a physical therapist or whether they might receive a similar benefit from a well designed home program<sup>4</sup>. Although home-based exercises have advantages over clinic-based exercises because they are inexpensive and easy to perform, there are concerns about long-term implementation of home-exercise regimens<sup>1</sup>. Whether home-based programs are more or less effective than supervised, outpatient program is not yet clear.

Home exercise includes muscle stretching, ROM and strength training; have been reported to cause improvement in stiffness and in the pain scale<sup>5</sup>. It was reported that a combination of clinical-based exercises and home-based exercises reduce pain and improved function<sup>16</sup>. In patients with knee OA, it is important to maintain or improve knee ROM, increasing ROM has been shown to

improve discomfort and result in an increase in function<sup>3</sup>. Stretching exercise is one type of exercise performed to improve range of motion and has been shown to improve ROM in healthy elder people<sup>10</sup>. However, little is known about the effect of stretching exercise on knee ROM in patients with knee osteoarthritis, despite the fact that most of these patients have limited ROM.

The purpose of this study was aiming to determine the effect of home-based stretching exercise in improving knee pain and physical function in patients waiting for TKA.

## SUBJECTS AND METHODS

### Subjects

Twenty patients with severe knee OA, who were scheduled to have primary unilateral total knee arthroplasty (TKA), were recruited from the primary TKA clinic at King Faisal Specialist Hospital and Research Centre (KFSH&RC) in Riyadh, Saudi Arabia. Inclusion criteria includes: Saudi patients, both sexes, their age ranged from 45-70 years. Patients who had self reported cardio-respiratory disease, neurological disease, or lower limb disorders other than knee OA and patients who could not follow instructions were excluded from the study.

The purpose and procedures of the study were explained for all patients, and consent form was taken from them before initial testing. After revision of the medical records of patients, demographic and baseline characteristics of subjects data including age, sex, body mass index (BMI) and duration of symptoms (years) were collected. A qualified female physical therapist was familiarized with the study protocol including the assessment procedures and the exercise program.

After the baseline measurements, Patients were assigned into two groups, the stretching group who performed home-based stretching exercises prior to their admission to the hospital and the control group who didn't performed stretching exercise prior to their admission to the hospital.

### Treatment measures

Subjects in the stretching group were instructed to perform daily home stretching exercise until the date of admission to the hospital for surgery. Stretching exercise involves stretching for both quadriceps and hamstrings muscles. The patients performed each exercise in the presence of the main investigator so that any questions about the exercises could be explained. Stretching for the hamstrings muscles was done while the patient lies in a supine position with a towel wrapped around the foot the leg is fully extended at the knee and then is lifted up from the resting position until the stretch is felt behind the knee. Stretching for quadriceps muscles was done while the patient sitting on the floor, patient flex the knee assisted by the hand, or knee flexion assisted by hand or by the opposite leg while the patient in a prone position. Subjects had to keep the knee flexed as much as possible for 30 seconds and repeat the same exercise for 10 times at least once a day.

Subjects in the control group were instructed to maintain their current level of physical activity until their admission to the hospital.

### Outcome measures

Assessment for both groups was done at baseline (the day when they registered for a TKA operation) and reassessed just after admission to hospital for operation. Assessment included knee pain measured by visual analogue scale, Knee ROM and physical function of the knee.

Assessment of knee pain was measured by visual analogue scale in which patients completed a 10cm visual analogue scale based on the degree of pain they had experienced in the last 7 days, while walking on a flat surface, where 0 indicated no pain and 10 indicated extremely intense pain. The use of the visual analogue scale to assess pain and most specifically musculoskeletal knee pain has been found to be a valid and reliable measurement tool<sup>21</sup>.

Assessment of Knee ROM was measured from maximum extension to flexion using universal Goniometer. While the patient lays in prone position the fulcrum (Axis) of the

Goniometer on the lateral axis of the knee joint, the Stationary arm aligned with greater trochanter and moving arm aligned with lateral malleolus.

Assessment of Physical function was measured using Western Ontario and McMaster Universities OA Index (WOMAC). Physical function was quantified using the WOMAC questionnaire with a scale from 26 (no difficulty) to 130 (extreme difficulty) indicating the level of difficulty associated with overall functional activities due to knee pain, including subscales of knee pain (35 points), stiffness (10 points) and physical function (85 points). WOMAC scoring has been found to be a valid and reliable tool to use in knee osteoarthritic subjects<sup>13</sup>.

## Data Analysis

The mean demographic data for both groups at the baseline measurements were compared using student t-test. Pain intensity, knee ROM, and physical function between baselines and post intervention in both groups were evaluated using paired t-test. An alpha value was accepted at 0.05 level of probability.

## RESULTS

Both groups were similar in age, BMI and duration of complained (Table 1). At the beginning of the study, there were no differences between groups on the dependent variables of knee pain, knee ROM and knee physical function (WOMAC).

**Table (1): Physical characteristics of patients in both groups.**

Characteristics	Stretching group Mean $\pm$ S.D	Control group Mean $\pm$ S.D	P. value
Age (year)	60.12 $\pm$ 6.71	60.51 $\pm$ 7.9	P> 0.05
BMI (kg/m <sup>2</sup> )	30.96 $\pm$ 3.92	29.99 $\pm$ 4.57	P> 0.05
Duration of complain (year)	9.98 $\pm$ 4.51	10.12 $\pm$ 5.14	P> 0.05

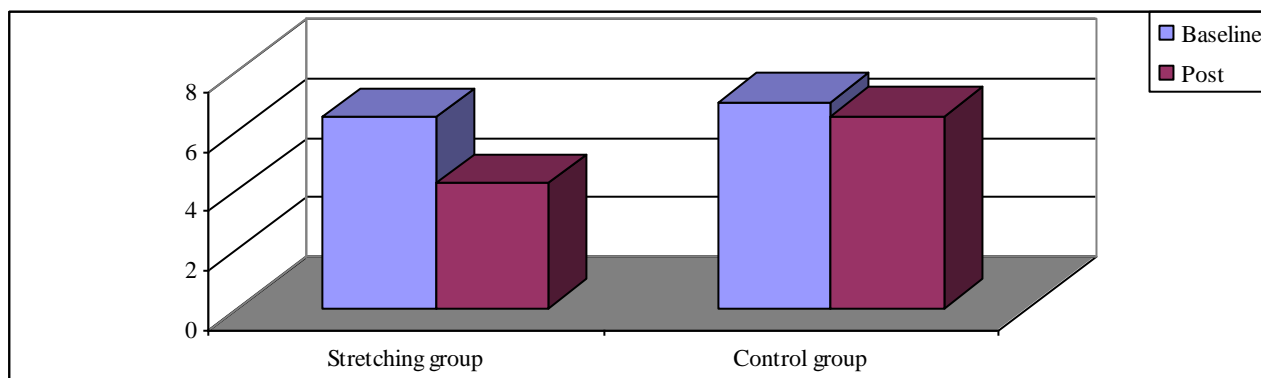
In the stretching group comparison of knee pain, knee ROM and WOMAC from baseline to the date of admission, there were significant differences (P< 0.05 for all), as shown in the table 2. In the control group, there were no significant difference (P>0.05 for all) regarding knee pain, knee ROM, and

physical function (WOMAC) from baseline to the date of admission, as shown in (table 2).

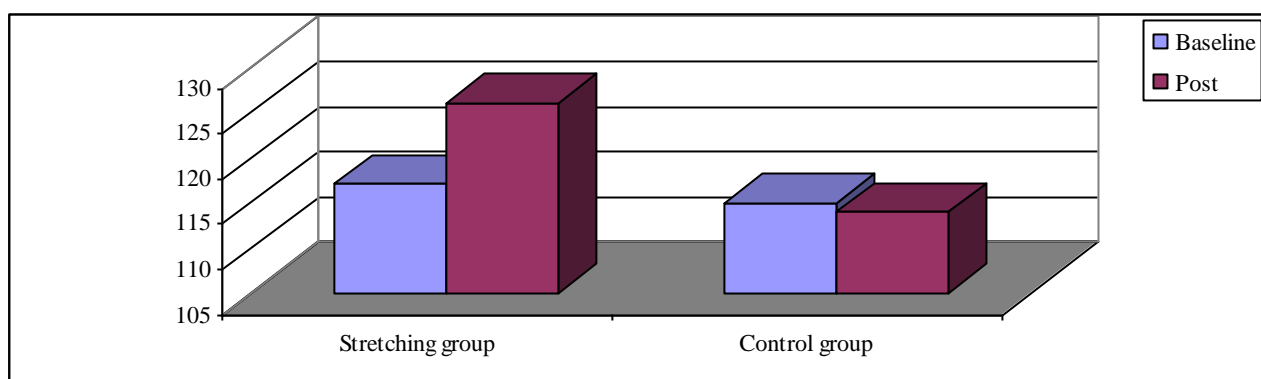
In comparing between the stretching and control group, there were significant differences in knee pain, knee ROM, and physical function (WOMAC as shown in figures (1, 2 and 3)).

**Table (2): Comparison of VAS, knee ROM and WOMAC variables in both groups.**

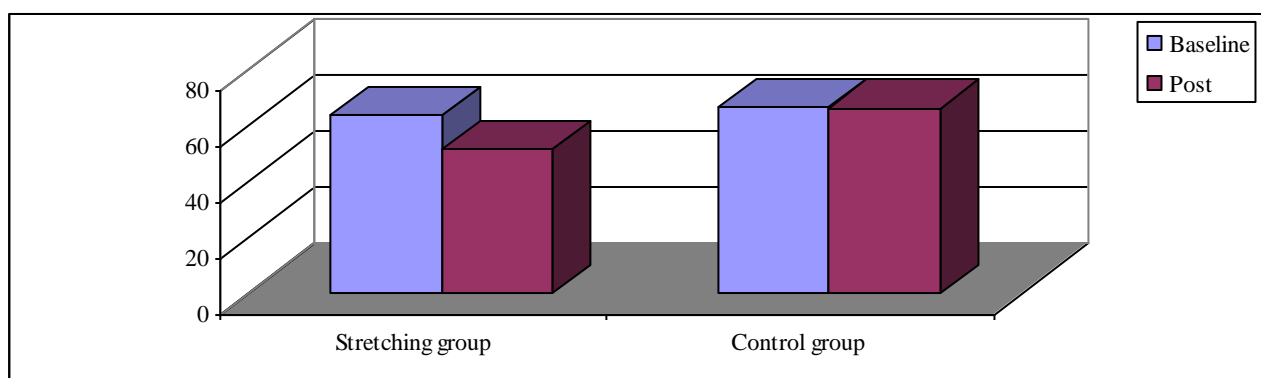
Variables	Stretching group		Control group	
	Baseline	Date of admission	Baseline	Date of admission
VAS	6.43 $\pm$ 1.86	4.21 $\pm$ 1.09	6.93 $\pm$ 1.74	6.47 $\pm$ 1.69
P. value		<0.001		>0.05
Knee ROM	117 $\pm$ 12.13	126 $\pm$ 11.34	115 $\pm$ 11.32	114 $\pm$ 11.47
P. value		<0.001		>0.05
WOMAC				
Pain	11.56 $\pm$ 2.21	7.45 $\pm$ 1.92	12.03 $\pm$ 1.91	11.98 $\pm$ 1.15
Stiffness	4.52 $\pm$ 1.64	2.64 $\pm$ 0.99	5.18 $\pm$ 1.18	4.97 $\pm$ 1.12
Physical function	48.91 $\pm$ 6.14	41.87 $\pm$ 5.45	49.82 $\pm$ 5.86	51.22 $\pm$ 5.15
Over all WOMAC	63.54 $\pm$ 8.87	51.63 $\pm$ 7.62	66.36 $\pm$ 8.23	66.03 $\pm$ 6.32
		<0.001		>0.05



**Fig. (1): Comparisons of the VAS at baseline and post intervention in both groups.**



**Fig. (2): Comparisons of the ROM at baseline and post intervention in both groups.**



**Fig. (3): Comparisons of Overall WOMAC at baseline and post intervention in both groups.**

## DISCUSSION

Physiotherapy is one of the most important components of therapy for knee osteoarthritis. The effect of regular exercise in the management of pain and improvement of physical function has been established in patients with knee OA<sup>15</sup>. A home-based exercise is prescribed to patients with knee OA as a part of the rehabilitation program to maintain their function, and improve their impairments<sup>18</sup>.

The present study indicated that a home-stretching exercise resulted in significant

reduction of knee pain and improvement of function in elderly subjects with knee osteoarthritis. In the present study, the stretching group had significantly greater improvement in knee ROM than the control group. The present results are in agreement with another study<sup>16</sup>, showed that pain scores improved compared with baseline in the stretching training group as compared with control.

A growing body of evidence shows that exercise improves knee joint function and decrease symptoms in patients with knee OA<sup>8</sup>. Pain reduction seen after stretch compared

with the baseline in the stretching group as compared with the control, could be attributed to the effect of ROM exercise performed daily<sup>17</sup>. Also, reduction in knee pain may be due to improvement in soft tissue flexibility<sup>1</sup>. Benefits have been reported with stretching exercise in reduction of pain<sup>11</sup>. Thus improvement in soft tissue flexibility may have led to a reduction in knee pain in the stretching group.

The need for cost effectiveness throughout the health care system emphasizes the importance of a well-designed home program. Generally, a home-based exercise program is prescribed to patient as a part of the rehabilitation program to improve function and ADL. Home exercises have the advantage that patients can perform the exercises at any time and at low cost, Thomas et al.,<sup>19</sup> showed that home-based exercise for two years could result in significant control of knee pain<sup>19</sup>. Various work have reported good results with treatment protocol consists of stretching exercises for quadriceps and sural triceps muscles in improvement in knee range of motion, even when the exercises are performed in the patient's home<sup>4,5</sup>. One important issue in home exercise is that the continuity of the daily stretching exercise depends on the patient himself.

Patients in this study were instructed to perform a simple exercise program in the form of stretching exercise for the knee joint. Harvey et al.,<sup>10</sup> reported that a minimum of 3 weeks is required to improve ROM by stretching, which in consistence with our study. The period of treatment in this study was 3 months until patient admission to hospital which agree with the last finding.

In the present study, home-based stretching exercises appear to be effective in patients with knee OA awaiting TKA but didn't save patients with severe OA from doing arthroplasty. Knee flexibility after TKA is dependent on preoperative range of knee flexion. It is well known that the preoperative range of motion affects the patients' functional ability after TKA<sup>7</sup>. Also, simple preoperative home-based stretching exercises are easy to perform and can significantly reduce knee pain.

This study was limited by the small size of patients, although the stretching exercise was applied to patients waiting TKA, all subjects were ambulatory, and hence, the results should not be extrapolated to a non-ambulatory population with severe knee osteoarthritis. However, we could not account to have any weight reduction program in our study as our subjects were overweight which could affect OA.

It could be concluded that home-based stretching exercises have positive effects in reducing pain and improvement in knee function among patients with severe osteoarthritis waiting for TKA. This improvement may provide better results after surgery. Simple, low-cost home based stretching exercises are easy to perform and are beneficial for knee OA.

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### الملخص العربي

#### تأثير تمارين الاستطالة بالمنزل على ألم الركبة والوظائف الطبيعية لمرضى التهاب مفصل الركبة

تعتبر خشونة الركبة من المشاكل الصحية الشائعة لكبار السن. الهدف من هذه الدراسة هو معرفة تأثير تمارين الاستطالة بالمنزل على ألم الركبة والوظائف الطبيعية لمرضى التهاب مفصل الركبة والذين ينتظرون عملية استبدال مفصل الركبة. أجريت الدراسة على عشرين مريضاً ممن يعانون من الالتهاب الشديد لمفصل الركبة قسموا إلى مجموعتين: المجموعة (التجريبية) والتي خضعت لتمارين الاستطالة بالمنزل مرة يومياً لمدة ثلاثة شهور، والمجموعة (الضابطة) والتي نصحت بالأسقرار على معدل النشاطات الطبيعية حتى موعد إجراء العملية الجراحية. تم قياس شدة ألم الركبة والوظيفة الطبيعية للركبة باستخدام مقياس وماك (WOMAC) عند البداية ويوم تنويم المريض بالمستشفى لأجراء عملية استبدال مفصل الركبة. وقد أظهرت النتائج تحسن ذو دلالة إحصائية في درجة الألم والوظيفة الطبيعية لمفصل الركبة بالمقارنة للمجموعة التي خضعت لتمارين الاستطالة بالمنزل مقارنة بالمجموعة الضابطة. من هذه النتائج يمكن استخلاص إيجابية تمارين الاستطالة بالمنزل على تثبيط الألم وزيادة الوظيفة الطبيعية لمفصل الركبة للمرضى الذين يعانون من الالتهاب الشديد لمفصل الركبة.