

To See Changes Following Physiotherapy in Pain, Range of Motion, Muscle Strength, and Functional Performance in Patients with Osteoarthritis of Knee.

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Abstract:

Background: Osteoarthritis (OA) is a chronic, non-inflammatory, degenerative joint disease with Knee OA being the most prevalent one with main factor of disability among middle-aged and older people worldwide. Age and repetitive mechanical loads being the main causative factors, it shows pain Knee range to be painful. Techniques like IFT and wet packs, physiotherapy seeks to reduce signs and symptoms including pain and oedema. Non-weight-bearing muscle-strengthening exercises have been shown to be useful.

Methodology: A Case series was carried out by the Interns on Patients having osteoarthritis of knee who visited Physiotherapy OPD, Dhiraj Hospital, with a minimal sample size of 5 cases, for the study duration of 3 Months. The Inclusion Criteria for the study were: Both Male and Female patients with Age 40-70 years, Patients diagnosed with Unilateral/bilateral OA knee, willing to perform physical therapy exercise, having Kellgren-Lawrence Grade 1 & 2 graded by radiologist.

Outcome Measures used were: Numeric Pain Rating Scale, Western Ontario and McMaster universities arthritis index (WOMAC), Repetition Maximum (RM), Goniometry.

Result: The results showed decrease in pain, Increase ROM of knee ranges, improve strength of the muscles and better functional performance

Conclusion: It was observed that Physiotherapy improved knee range of motion, muscle strength, pain and physical function in patient with osteoarthritis of knee.

Keywords: Knee OA, Physiotherapy, Pain, ROM, Functional Performance

Osteoarthritis (OA) is a chronic, non-inflammatory, degenerative joint disease marked by cartilage breakdown, osteophyte formation, and subchondral sclerosis, which manifests as gradual involvement of synovial, diarthrodial, and especially load-bearing joints. The most prevalent kind of OA is knee OA, and age closely correlates with its frequency. ¹ It is the most prevalent kind of arthritis and the main factor in disability among middle-aged and older people around the world. ² With a prevalence of 22%

to 39% in India, osteoarthritis is the most prevalent joint illness and the second most common rheumatological condition. ³

The knee is the most often affected region in the lower leg and the likelihood of acquiring OA increases after age 45. ⁴ It is a complex phenomenon with several underlying causes, including trauma, mechanical forces, inflammation, biochemical reactions, and metabolic abnormalities. Osteoarthritis is brought on by age and repetitive mechanical loads. OA joint deterioration makes pain more likely. It comprises a range of motion being painful, from a throbbing intense ache to a dull aching discomfort. ⁵

The range of motion (ROM) that is involved in everyday activities and quality of life may be impacted by the pattern and severity of pain associated with OA knees, which can range from nonexistent to mild, moderate, severe, or very severe. Individuals with OA knees report continuous discomfort, a decline in their capacity to use their joints, and muscle weakness. ⁶ Joint swelling is typically a late symptom brought on by effusion from synovial inflammation. Joint swelling is typically a late symptom and results from effusion brought on by synovial tissue inflammation. Initially, stiffness results from pain and muscular spasm, but subsequently capsular contracture and irregularity of the joint surfaces also play a role. They typically arise in the morning and make daily tasks challenging. ⁷

A feeling of "instability" in the joint and "locking" brought on by loose bodies and frayed menisci are additional symptoms. Quadriceps weakness, joint damage, being overweight, and developmental impairments are all risk factors for developing OA of the knee. ⁸ The Western Ontario and McMaster Universities osteoarthritis index is a valid and reliable tool for assessing the patients' level of disability (WOMAC). It is a questionnaire that assesses how well people with disabilities can do activities of daily living. ⁹

With techniques like IFT and wet packs, physiotherapy seeks to reduce signs and symptoms including pain and oedema. Non-weight-bearing muscle-strengthening exercises have been shown to be successful in regaining range of motion (ROM), reducing discomfort, and enhancing daily activity performance. ¹⁰ Moreover, IFT demonstrates improvement in terms of ROM, WOMAC score, and pain. Hence, lowering knee pain helps people with OA knees function more physically. ¹¹ Patients with knee OA may find that therapeutic exercise and TENS therapies are effective in reducing pain and enhancing function. ¹² Several scales are frequently employed to rate the severity of pain. The NPRS and VAS are two of them that are frequently utilised in therapeutic settings. ¹³ These scales for measuring pain intensity have demonstrated strong validity and reliability.

The studies of therapeutic exercises and modalities for osteoarthritis knee are frequently advocated and used for rehabilitation, however the results of studies demonstrating their combined effectiveness for osteoarthritis knee rehabilitation are still inconclusive. So, the goal of this study is to observe improvements in pain, range of motion, muscular strength, and functional performance in patients with osteoarthritis of the knee after a customised physiotherapy treatment.

PROCEDURE

The following study is a Case series carried out by the Interns on Patients having osteoarthritis of knee who visited Physiotherapy OPD, Dhiraj Hospital, with a minimal sample size of 5 cases, for the study duration of 3 Months The Inclusion Criteria for the study were: Both Male and Female patients with Age 40-70 years, Patients diagnosed with Unilateral/bilateral OA knee, willing to perform physical therapy exercise, having Kellgren-Lawrence Grade 1 & 2 graded by radiologist.

The Exclusion Criteria for the study were: Patients already undergone Total knee replacement or any kneesurgery, Patients with Cardiac, Neurological disorders or illness, Fractures around the knee joint and Kellgren-Lawrence Grade 3 & 4 on Xray

MATERIALS: Universal Goniometer & Weight cuff were the two equipments used for the study.

The following were the Outcome Measures:

1. Numeric Pain Rating Scale to measure pain Intensity levels
2. Western Ontario and McMaster universities arthritis index (WOMAC) to measure the functional performance of OA Knee patients
3. Repetition Maximum (RM) Method to measure the strength of the Knee musculature
4. Goniometer to measure the range of motion for the knee joint.

The study was forwarded to the Institutional ethics committee, College of Physiotherapy for approval. After obtaining the approval from Institutional ethical committee, patients from Dhiraj General Hospital diagnosed as OA Knee and willing to participate were screened.

After screening for the selection criteria, the participants fitting in the category was explained the purpose of the study and a written informed consent was obtained prior to the study procedure. Participants were assessed according to the standard assessment format.

After the assessment, outcome measures were taken and patient were treated according to tailor made protocol for 3 consecutive days. At the end of the third day outcome measures were repeated and the findings were noted.

1. For Measuring Pain²⁰

Numerical Pain Rating Scale: The patients are asked to circle the number between 0 and 10, a 11 point scale that fits best to their pain intensity. '0' usually represents no pain whereas the upper limits represents the worst pain. NPRS have shown high correlations with other pain assessment tools in several studies. The feasibility of its use and good compliance has also been proved.

2. For Functional Performance²¹

WESTERN ONTARIO AND MCMASTER UNIVERSITIES OSTEOARTHRITIS INDEX SCALE (WOMAC): Western Ontario and McMaster Universities Osteoarthritis Index scale has 17 items divided into three sections (A, B, C for pain, stiffness, and functional difficulty respectively). Subjects are asked to rate their score out of five grades of severity, i.e., no pain, mild pain, moderate pain, severe pain, and extreme pain.

3.(A) Knee Flexion Rom measurement²²

- Therapist Position: Sitting on a stool
- Patient's Position: Prone lying with both feet off the end of the table with a towel under the distal femur to prevent compression of patella.
- Hip is in 0 degree of abduction, adduction, flexion, extension and rotation.
- Goniometer Placement:
 - Proximal Arm: Lateral midline of femur
 - Fulcrum: Lateral epicondyle of femur
 - Distal Arm: Lateral midline of fibula

(B) KNEE EXTENSION ROM MEASUREMENT²²

- Knee extension is measured and recorded in the same manner as the knee flexion because it returns to the starting position from the end of the knee flexion ROM.
- So, the testing position, alignment and stabilization remains the same as for knee flexion.

4. MUSCLE STRENGTH (RM Method)²³

- The maximum weight a person could lift for 10 consecutive repetitions.
- The direct application of weights to the body forms a simple and effective method of resisting active exercise.
- The apparatus required is weight cuffs which can be directly attached to the part with straps.
- Any number of units of weight can be inserted to provide the required resistance.
- For knee flexors : patient is in prone position.
- For knee extensors : patient is in high sitting.



Figure 1. Knee Flexion ROM



Figure 2. VMO Strengthening



Figure 3. IFT



Figure 4. Knee Extensors Strengthening



Figure 5. Straight Leg Raise

RESULT

TABLE 1. DEMOGRAPHIC DETAILS OF PATIENTS

Characteristics	Data
Total Population	5 Participants
Gender	
Male	2
Female	3
Mean Age	55 Years

Table 1 shows Demographic data which shows that there were 2 males and 3 female patients for the study. The Average age is 55.

TABLE 2. RANGE OF MOTION OF KNEE FLEXION(IN DEGREES)

Sr.No	Age/Sex	Site	Right			Left		
			Day1	Day3	Difference	Day1	Day3	Difference
1.	61/F	Bilateral	0-130	0-135	5	0-120	0-130	10
2.	49/F	Left	-	-	-	0-110	0-120	10
3.	62/M	Right	0-100	0-110	10	-	-	-
4.	55/M	Bilateral	0-120	0-130	10	0-130	0-140	10
5.	62/M	Left	-	-	-	0-130	0-130	0
			Mean Difference		8.3	Mean Difference		7.5

Table 2 shows Range of motion of knee flexion of both right and left side of Day 1 and Day 3 and it suggests mean difference of right and left knee is 8.3 degree and 7.5 degree respectively.

TABLE 3. RANGE OF MOTION OF KNEE EXTENSION (IN DEGREES)

Sr No.	Age/Sex	Site	Right			Left		
			Day 1	Day 3	Difference	Day 1	Day 3	Difference
1.	61/F	Bilateral	130-0	135-0	5	120-0	130-0	10
2.	49/F	Left	-	-	-	110-0	120-0	10
3.	62/M	Right	100-0	110-0	10	-	-	-
4.	55/M	Bilateral	120-0	130-0	10	130-0	140-0	10
5.	62/F	Left	-	-	-	130-0	130-0	0
			Mean difference		8.3	Mean difference		7.5

Table 3 shows Range of motion of knee extension of both right and left side of Day 1 and Day 3 and it suggests mean difference of right and left knee is 8.3 degree and 7.5 degree respectively.

TABLE 4. MUSCLE TESTING BY 10 RM FOR KNEE FLEXORS (10 RM)

Sr No.	Age/Sex	Site	Right			Left		
			Day 1	Day 3	Difference	Day 1	Day 3	Difference
1.	61/F	Bilateral	2	2.5	0.5	1	1.75	0.75
2.	49/F	Left	-	-	-	1.5	2.5	1
3.	62/M	Right	3	3.75	0.75	-	-	-
4.	55/M	Bilateral	2.5	2.5	0	2.5	3	0.5
5.	62/F	Left	-	-	-	3	3.5	0.5

Table 4 shows muscle testing of knee flexors of both right and left side of day 1 and day 3.

TABLE 5. MUSCLE TESTING BY 10 RM FOR KNEE EXTENSORS (10RM)

Sr No	Age/Sex	Site	Right			Left		
			Day 1	Day 3	Difference	Day 1	Day 3	Difference
1.	61/F	Bilateral	3	3.5	0.5	3	3.5	0.5
2.	49/F	Left	-	-	-	2.5	3.5	1
3.	62/M	Right	2.5	4.25	1.75	-	-	-
4.	55/M	Bilateral	5	5	0	5	5.75	0.75
5.	62/F	Left	-	-	-	4	4.5	0.5

Table 5 shows muscle testing of knee extensors of both right and left side of day 1 and day 3.

TABLE 6 .WOMAC SCALE FOR FUNCTIONAL COMPONENT

Sr No.	Age/Sex	Site	Functional Performance (out of 96)		
			Day 1	Day 3	Difference
1.	61/F	Bilateral	33	19	14
2.	49/F	Left	36	27	9
3.	62/M	Right	43	34	9
4.	55/M	Bilateral	32	16	16
5.	62/F	Left	41	35	6
			Mean Difference		10.8

Table 6 shows score of functional component score of the WOMAC scale of day 1 and day 3. It suggests mean difference of functional score is 10.8.

TABLE 7. NPRS FOR PAIN

Sr No.	Age/Sex	Site	On Rest			On Movement		
			Day 1	Day 3	Difference	Day1	Day3	Difference
1.	61/F	Rt	1	0	1	3	2	1
		Lt	1	0	1	4	2	2
2.	49/F	Rt	-	-	-	-	-	-
		Lt	1	0	1	3	2	1
3.	62/M	Rt	2	1	1	5	3	2

		Lt	-	-	-	-	-	-
4.	55/M	Rt	2	0	2	4	2	2
		Lt	0	0	0	2	1	1
5.	62/F	Rt	-	-	-	-	-	-
		Lt	2	1	1	4	3	1
			Mean Difference		1	Mean Difference		1.42

Table 7 shows the pain of right and left side of day 1 and day 3 on rest the mean difference is 1 and on movement the mean difference is 1.42.

DISCUSSION

In this study, total 8 patients had Osteoarthritis of Knee but as per inclusion criteria 5 patients were recruited of this, from which patients from inclusion criteria; 2 subjects were male and 3 subjects were female. Their mean age was 55 years (40 years to 70 years). 2 subjects had Bilateral Osteoarthritis of knee, 1 subject had Right side Osteoarthritis of knee, and 2 subjects had Left side Osteoarthritis of knee. On 3rd day patients showed increase in Range of motion of knee flexion on right side and on left side as shown in Table 2. While also there was increase in knee extension Range of motion on right side and on left side as shown in Table 3.

On 3rd day, all the patients showed increase in muscle strength of Knee flexors on right side and on left side as shown in Table 4. There was also increase in muscle strength for Knee Extensors on right side and on left side as shown in Table 5. In WOMAC scale there was mean difference of 10.8. These data suggested that there was increase in knee range of motion and improvement in functional component of WOMAC scale by 3rd day as shown in Table 6.

In a study done by Pallab Das, Manas Das²⁴ in 2017 to compare the effectiveness of therapeutic Ultrasound and Interferential Therapy in which all the subjects with knee pain and clinically diagnosed as OA knee were screened as per the inclusion and exclusion criteria. The patients received therapeutic exercises which included Isometric Quadriceps exercises, Straight Leg raises, Hamstrings stretching, AROM exercises for knee. As a result it showed that IFT had more effect in reducing the pain and improving physical function of patients with Osteoarthritis of knee.

The present study showed improvement in knee range of motion, increase in muscle strength as well as reduction in pain after physiotherapy treatment.

In a similar study done by Hani A. Alkhwajah and Ali M. Alshami²⁵ in 2019 concluded that the effect of mobilization along with movement in patients with Osteoarthritis of knee provided improvement in terms of knee flexion ROM, physical function (walking), local and wide spread pain, knee flexors and extensors muscle strength.

A study done by Abadel-azeim AA, Soliman ES²⁶ et al. in 2018 to see the effects of physiotherapy rehabilitation program in patients with osteoarthritis of knee found that there was reduction in pain, improvement in knee range of motion, increase in quadriceps muscle strength and improvement in physical function after physiotherapy rehabilitation program encompassing electrotherapy modalities, stretching and strengthening exercise.

The present study also showed improvement in Range of motion, increase in muscle strength when resisted exercise with weight cuff was given to patients and also reduction in pain when IFT was given.

In another study done by Cid André Fidelis de Paula Gomes, Fabiano Politti²⁷ et al in 2020 on the effects of exercise and exercise along with electrotherapeutic modalities showed that there is improvement in the

WOMAC score and pain in patients with osteoarthritis of knee when only physiotherapy exercises are given and there is also improvement in the WOMAC score and pain of the patients when exercises are given along with IFT for osteoarthritis of knee. The present study is done where exercises are given in conjunction with IFT and it shows there is improvement in WOMAC score of pain and physical function of the patients with OA of knee when physiotherapy is given.

This showed that physiotherapy played an important role in increasing Range of motion, improving muscle strength, reducing pain and improving physical function in patients with Osteoarthritis of knee.

CONCLUSION

It was observed that Physiotherapy improved knee range of motion, muscle strength, pain and physical function in patient with osteoarthritis of knee.

LIMITATION OF THE STUDY:

The major limitation of the study is the Sample size as it is a Case Series. Proprioception of the Knee joint was not assessed.

SCOPE OF THE STUDY:

A prospective study can be done with longer duration of treatment, seeing the effect of physiotherapy on the long term basis.

CONFLICT OF INTEREST:

The author describes that there was no conflict of Interest.

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