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Effect of Structured Physiotherapy Protocol on Pain, Range of Motion of Knee, Muscle Power and Disability in Patients with Tibiofemoral Osteoarthritis

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Abstract: ***Tibiofemoral Osteoarthritis is a prevalent condition affecting millions of people worldwide. Physiotherapy is a non - invasive intervention that is effective in managing Tibiofemoral Osteoarthritis symptoms by aiming to reduce pain, improve function, and enhance quality of life. The main interventions are, exercise therapy, including strength training, and patient education about self - management strategies, such as weight loss, activity modification, and pain coping skills. A combination of several interventions, depending on patient preferences, is recommended for optimal outcomes in managing Tibiofemoral osteoarthritis. Osteoarthritis is a major cause of musculoskeletal disability; non - pharmacological and non - surgical treatment is preferred for management of Tibiofemoral Osteoarthritis. Method: The preliminary study has been conducted on a (n = 40) sample of convenience. The samples were randomly allocated into two study groups, Group 1 (experimental), and Group 2 (control). The control group was advised on a basic home program. On the other hand, the treatment of the intervention group was designed with a therapist supervised Physiotherapy Protocol. The outcome variables studied were the Visual Analogue Scale, Modified WOMAC Scale. All patients also received combined physical therapy exercise protocol were applied 6 days a week for 4 weeks. Results: The results of the study revealed a significant improvement among most of the studied outcome measures in the experimental group. Conclusion: The structured physiotherapy protocol was found effective in relieving multiple physiological impairments associated with this whole joint disease.***

Keywords: Tibiofemoral osteoarthritis; exercise therapy; manual therapy; physiotherapy; pain; disability; physiotherapy protocol, consisting of Patient Education, Progressive resistance exercise, passive Stretching exercises and Soft Tissue Manipulation (STM), Muscle Energy Technique (MET) and Maitland mobilization, and neuromuscular training.

1. Introduction

Tibiofemoral joint has been the most common joint affected by Osteoarthritis (OA) in patients older than 60 years. About 10 - 20% of this population experience knee pain globally. Around 80% of their experience restriction in movement and remaining 20% are not able to perform activities of daily living, 11% of tibiofemoral OA patients need assistance in basic individual care (1).

Tibiofemoral osteoarthritis is common degenerative disease and its prevalence and incidence are increasing.[1]Degenerative joint arthritis is the most common joint disorder that is caused by biomechanical stress affecting both articular cartilage and subchondral bone.[2]Tibiofemoral OA is directly related to disabilities due to pain quadriceps disfunction and impaired proprioception.[3]

Unlike many others pain conditions in which underlying injuries typically heals or resolves osteoarthritis is a disease that does not resolve. Thus, OA is typically accompanied by chronic pain.[4]

Pain is one the most commonly reported and prominent factors that are responsible for physical activity in patient with Tibiofemoral OA.[5]

Pain pattern and severity of Tibiofemoral OA as either absent, mild, moderate, severe or very severe could affect the range of motion (ROM) that involves daily activities and quality of life.[6]

Moreover, muscle weakness in Tibiofemoral OA usually results in joint stiffness and decreasing ROM that involves daily activities.[7]

Correct conventional treatments include non - pharmacological measures and surgical procedures among non - pharmacological intervention manual therapy is widely used for musculoskeletal conditions.[8]

2. Materials and Methods

The preliminary study with analysis by protocol, consisted of a sample of convenience of 40 participants who were randomly allocated into two groups, the group 1 experimental group (n = 20) and group 2 control group (n = 20).

Participants: 40 subjects were selected on basis of inclusion criteria as follows.

Inclusion and exclusion criteria:

Inclusion criteria:

- Subjects with grade 1 and grade 2 (Kellgren - Lawrence Classification of Osteoarthritis) Tibiofemoral osteoarthritis.9
- The included age group were 45 to 70 years.
- Clinically, diagnostic confirmation of knee or Tibiofemoral osteoarthritis was performed according to the BIRRD TRUST Hospital.

Exclusion criteria:

Secondary osteoarthritis of tibiofemoral joint, any fractures around the knee, corticosteroid intra articular injections.

Intervention:

Individuals in the control group were given handouts of a basic home program containing knee isometric exercises with self - stretching exercises for quadriceps femoris, hamstrings, gastro - soleus and precautionary advice of Dos and Don'ts regarding Tibiofemoral osteoarthritis.

The experimental group was administered with a structured physiotherapy protocol, consisting of Patient Education (PE), Progressive resistance exercise (PRE), passive Stretching (PS) exercises and Soft Tissue Manipulation (STM), Muscle Energy Technique (MET) and Maitland mobilization, and neuromuscular training, three sessions per week for four weeks. The patients' education session was conducted once a week during the entire study period, hence a total of four education sessions were conducted are described in table 1.

Table 1: shows structured physiotherapy protocol used for experimental group

S. No	Exercise	Description	Steps /Repetitions & Hold Time	Inter - Repetition/ Inter - Set Rest Time	Duration
1	Patient Education	4 SESSIONS	1 session per week for 4 weeks		4 Weeks
2	Progressive Resistance Exercise (PRE)	With patient specific resistance, for: • Knee extensors • Knee flexors • Hip extensors • Hip flexors • Hip abductors • Hip external rotators • Ankle dorsiflexors • • Ankle plantar flexors	3 sets of 10 repetitions with 10 s hold	2 s between repetitions and 30 s between sets	4 Weeks
3	Stretching Exercise	Therapist performed passive stretching of: • Hamstrings • Quadriceps femoris • Gastro - Soleus	Single set of 3 repetitions with 30 s hold		4 Weeks
4	Soft Tissue Manipulation (STM)	• Peripatellar connective tissue • Quadriceps femoris • Hamstrings • Hip adductor • Gastro - Soleus • Fascia of thigh musculature • Fascia of leg musculature	3 to 5 min		4 Weeks
5	Muscle Energy Technique (MET)	Post isometric relaxation technique was administered after application of 15 min of superficial moist heat to: • Quadriceps femoris • Hamstrings • Hip abductors • Ankle plantar flexors	Single set of 5 repetitions, isometric contraction for 5 s and passive stretch for 10 s.	30 s between repetitions	4 Weeks
6	Maitland Mobilization	• Patellofemoral joint • Tibiofemoral joint • Distal tibiofibular joint • Talocrural joint • Talocalcaneal joint • Hip joint	Patient's needs		4 Weeks
7	Aerobic Exercise	Pedo - Cycling: At patient specific self - selected speed and seat height	3 sets of 50 repetitions	30 s between sets	4 Weeks
8	Neuromuscular Training:	1) Frenkel Exercise 2) Standing balance on unstable surface	1) 3 sets of 15 repetitions 2) 3 sets of 3 repetitions with 60 s hold	1) 3s between repetitions and 30 s between sets 2) 120 s between repetitions as well as between sets	4 Weeks

Outcome Measure:

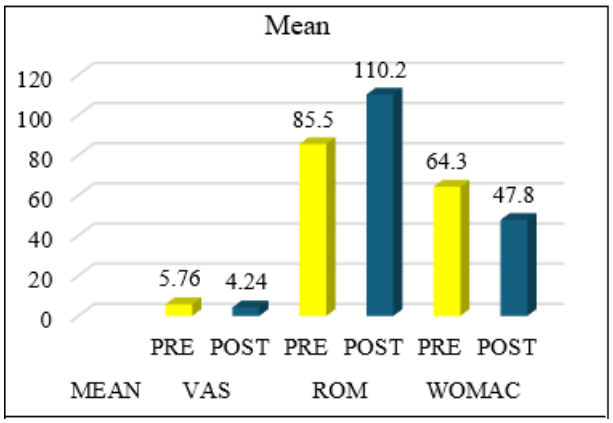
- Pain intensity - Visual Analogue Scale (VAS).1[1]
- The modified Western Ontario and McMaster University (WOMAC) used for quality of life[12]
- Measurement of active knee flexion ROM; - universal goniometer.1[3]

3. Results

SPSS 22 was used, the overall significance for the chosen factor i. e., structured physiotherapy protocol in the test of between subject effects and pairwise comparison was found to be statistically significant. The administered interventional protocol, consisting of a combination of exercise therapy and manual therapy is found significantly effective in the management of Tibiofemoral osteoarthritis patients. Additionally, the data showed evidence for aging as a factor impacting the slow response of the administered protocol. Paired t results of Pre & Post treatment score.

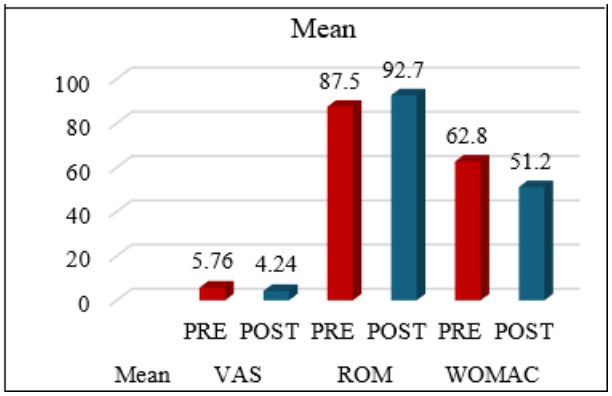
Statistics of experimental group:

		Mean	SD	t - value	P - value
VAS	Pre	5.76	1.9	11.47	0.000
	Post	4.24	2.05		
ROM	Pre	85.5	11.1	- 9.85	0.000
	Post	110.2	7.9		
WOMAC	Pre	64.3	17.1	13.83	0.000
	Post	47.8	20.9		



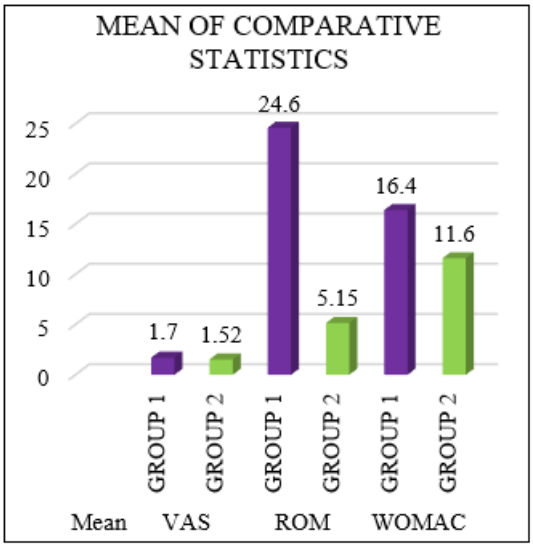
Statistics of control group:

		Mean	SD	t - value	P - value
VAS	Pre	5.76	1.91	7.49	0.000
	Post	4.24	2.05		
ROM	Pre	87.5	11.2	- 3.09	0.006
	Post	92.7	11.2		
WOMAC	Pre	62.8	17.4	9.15	0.000
	Post	51.2	16.2		



Comparative statistics of experimental and control groups:

		Mean	SD	t - value	P - value
VAS	Group 1	1.70	0.66	0.137	0.089
	Group 2	1.52	0.9		
ROM	Group 1	24.6	- 9.85	5.527	0.000
	Group 2	5.15	5.6		
WOMAC	Group 1	16.4	13.83	2.862	0.007
	Group 2	11.6	5.6		



- VAS change: The comparative statistics of both experimental group and control group (P - Value: 0.089) has No significant difference
- WOMAC Change: The comparative statistics of both experimental group and control group (P - value: 0.000) IS highly Significant improvement in the experimental group compared to the control group.
- Knee flexion change: The comparative statistics of both experimental group and control group (P - value: 0.007) has Significant improvement in the experimental group compared to the control group.

4. Discussion

The purpose of conducting a preliminary study was to determine the medicinal potential of the structured physiotherapy protocol in an Indian tibiofemoral osteoarthritis population to relieve pain; improve static balance, dynamic balance, physical functional performance and hence, disability. Patient education is evidenced to have an important role in progressive diseases like osteoarthritis

where the sufferers started surviving in a restricted environment that leads to poor social interactions.[14, 15]

Recent studies supported administration of proper patient education to facilitate better management of disease. Exercise therapy is a well - studied and accepted therapeutic strategy to improve the knee osteoarthritic diseased state, however, the work done in exploring the therapeutic potential of manual therapy alone and in combination with exercise therapy for the disease is scarce.[16]

An administered, the structured physiotherapy protocol i. e., combination of patient education, exercise therapy and manual therapy was found to have a significant therapeutic role in improvement of static balance, dynamic balance, pain, physical functional performance, and disability in patients with tibiofemoral osteoarthritis. The result is evident in intervention data of the samples obtained after four weeks. The intervention group presented a significantly promising impact of the protocol, however, aging emerged as a potential factor that could slow down the therapeutic effect of the administered intervention. Aging being a common contributing factor of osteoarthritis, is well known to progressively cause cell senescence, altered apoptosis, mitochondrial dysfunction, oxidative stress, and homeostatic dysfunction; resultantly, the connective tissues comprising joints turned stiff, fragile and dehydrated. The continuum of deleterious changes associated with aging might be the reason for a delayed positive improvement with the protocol in the advanced age group, compared to the younger ones.

Though pain relief was obtained in both groups, the comparative improvement in pain between the two groups was not that significant. Exercise therapy and manual therapy individually, proved efficient to contribute to the symptomatic relief of the disease. tibiofemoral osteoarthritis being a chronic condition involves a psychological component of pain. Subjective belief and satisfaction could be the possible reasons behind the presented nonsignificant difference between the two groups, tested at the end of the study.

Functional performance and disability were investigated in the study with an intention to improve clinical practices of concern, to achieve patients' independence and better life quality. With the administered protocol the intervention group achieved a significant improvement compared to the pre - test scores and control group, the potential mechanism behind the improved scores streamlines with symptomatic relief, improved muscle conditioning, joint sense and balance that was achieved with exercise therapy and manual therapy.

The result of the preliminary study is consistent with the study, which demonstrated the effectiveness of structured exercise program in achieving functional improvement in the knee osteoarthritis population when provided in combination with manual therapy.[17]It made a favourable statement in a study that dealt with a knee osteoarthritis population, when they reflected a comparatively higher efficacy of a combination regimen of manual therapy and resistive exercise, than a regimen consisting of resistance exercise alone, in terms of bringing improvement in proprioception, functional performance and muscle strength.[18]

5. Limitations of the Study

The sample size was too small.

We faced greater limitation in terms of availability of the samples, treatment time, and rehabilitation centre. The study faced dropouts and was unable to include follow up due to difficulty in contacting patient's due patient's unavailability because of their working hours

Latest outcome measure tools with advanced technology were not included in the study because of limited accessibility of the resources.

6. Conclusion

- **VAS change:** The comparative statistics of both experimental group and control group (P - Value: 0.089) has No significant difference
- **WOMAC Change:** The comparative statistics of both experimental group and control group (0.000) IS highly Significant improvement in the experimental group compared to the control group.
- **Knee flexion change:** The comparative statistics of both experimental group and control group (P - value: 0.007) has Significant improvement in the experimental group compared to the control group.

References

[1] Bosomworth NJ: Exercise and knee osteoarthritis: benefit or hazard? Can Fam Physician, 2009, 55: 871–878.
[2] Hootman JM, Helmick CG: Projections of US prevalence of arthritis and associated activity limitations. Arthritis Rheum, 2006, 54: 226–229.
[3] Alnahdi AH, Zeni JA, Snyder - Mackler L: Muscle impairments in patients with knee osteoarthritis. Sports Health, 2012, 4: 284–292.
[4] Neogi T: The epidemiology and impact of pain in osteoarthritis. Osteoarthritis Cartilage, 2013, 21: 1145–1153.
[5] Veenhof C, Huisman PA, Barten JA, et al.: Factors associated with physical activity in patients with osteoarthritis of the hip or knee: a systematic review. Osteoarthritis Cartilage, 2012, 20: 6–12.
[6] Naal FD, Impellizzeri FM: How active are patients undergoing total joint arthroplasty? A systematic review. Clin Orthop Relat Res, 2010, 468: 1891–1904.
[7] Chan KK, Chan LW: A qualitative study on patients with knee osteoarthritis to evaluate the influence of different pain patterns on patients' quality of life and to find out patients' interpretation and coping strategies for the disease. Rheumatol Rep, 2011, 3: 9–15.
[8] Segal NA, Torner JC, Felson DT, et al.: Knee extensor strength does not protect against incident knee symptoms at 30 …, /months in the multicenter knee osteoarthritis (MOST) cohort. PM R, 2009, 1: 459–465.
[9] https: //www.ncbi. nlm. nih. gov/pmc/articles/PMC4925407/
[10] Glossary. *Spine* **2000**, *25*, 3200–3202. Available online: https: //journals. lww.

com/spinejournal/fulltext/2000/12150/glossary.16 . aspx (accessed on 27 November 2022).
[11] Haefeli, M.; Elfering, A. Pain assessment. *Eur. Spine J.2***006**, *15*, S17–S24. .
[12] Samuel, A. J.; Kanimozhi, D. Outcome measures used in patient with knee osteoarthritis: With special importance on functional outcome measures. *Int. J. Health Sci.2***019**, *13*, 52.
[13] Knee Range Of Motion: How To Measure & Improve - Knee Pain Explained (knee - pain - explained. com)
[14] Maly, M. R.; Krupa, T. Personal experience of living with knee osteoarthritis among older adults. *Disabil. Rehabil.2***007**, *29*, 1423–1433.
[15] Pouli, N.; Das Nair, R.; Lincoln, N. B.; Walsh, D. The experience of living with knee osteoarthritis: Exploring illness and treatment beliefs through thematic analysis. *Disabil. Rehabil.2***014**, *36*, 600–607.
[16] Pouli, N.; Das Nair, R.; Lincoln, N. B.; Walsh, D. The experience of living with knee osteoarthritis: Exploring illness and treatment beliefs through thematic analysis. *Disabil. Rehabil.2***014**, *36*, 600–607.
[17] Deyle, G. D.; Henderson, N. E.; Matekel, R. L.; Ryder, M. G.; Garber, M. B.; Allison, S. C. Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee: A randomized, controlled trial. *Ann. Intern. Med.2***000**, *132*, 173–181.
[18] Ko, T.; Lee, S.; Lee, D. Manual therapy and exercise for OA knee: Effects on muscle strength, proprioception, and functional performance. *J. Phys. Ther. Sci.2***009**, *21*, 293–299.