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Original Article

Effectiveness of home-based physiotherapy on pain and disability in participants with osteoarthritis of knee: an observational study

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Abstract. [Purpose] The objective of this observational study was to examine the effect of home physiotherapy on pain and disability in participants with knee osteoarthritis. [Participants and Methods] From January 2017 to December 2017, 139 participants who were recipients of HealthCare atHome physiotherapy services across various locations were included in the main analysis. The mean treatment cycle duration was 31.5 days (mean number of sessions delivered, 19.7). Physiotherapy was performed for approximately 45–50 min in the form of electrotherapy, exercise therapy, and manual therapy. Visual analog scale (VAS) scores were documented after each visit, whereas The Western Ontario and Mcmaster Universities Osteoarthritis Index (WOMAC) as an outcome were recorded weekly. [Results] Statistically significant improvement in the visual analog scale and Western Ontario and Mcmaster Universities Osteoarthritis Index scores were observed, with overall % improvement of 52% and 43%, respectively. [Conclusion] The average scores in pain and disability were reduced after home based physiotherapy.

Key words: Knee pain, Disability, Home physiotherapy

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INTRODUCTION

Knee osteoarthritis (OA) is a major cause of musculoskeletal disability in the older population, affecting both males and females[1–3)] as reported by the World Health Organization on the global burden of disease[4)]. Knee OA not only manifests as pain, joint stiffness, decreased quadriceps strength, physical disability, but also impacts overall disease outcome and quality of life[5–8)]. Pain reduction and functional improvement are the main goals of any treatment strategy in the management of knee OA. Combinations of treatment interventions are often selected over a single approach[9)]. Studies have documented benefits of exercise in reducing pain and improvement in functions in patients with knee OA[10–19)]. Furthermore, literature also suggests that physical therapy intervention, including exercise, may reduce the need for pharmacological and surgical interventions[12)]. Physical exercise, however, can be performed both in the clinic and at home. The beneficial effects of home-based physiotherapy have been clearly documented by Deyle[12)] and Thomas et al[20)]. Home-based physiotherapy has several advantages because it not only increases independence and teaches self-management, but also promotes empowerment. Home-based services with regular visits from health care professionals, consistent monitoring, and follow-up ensures continuity of patient care and patient satisfaction[21, 22)].

Because of these benefits, the present study performed an outcome analysis of home-based physiotherapy on pain and disability in patients with knee OA. The study also aimed to establish a benchmark for home-based physiotherapy services provided by HealthCare atHome by comparing our study with other available evidence.

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PARTICIPANTS AND METHODS

Inclusion criteria, the participants (both genders) were included if they were 40 years and older and had non-traumatic knee OA symptoms. Exclusion criteria, individuals with fixed deformities of knee and other associated systemic problems, and who underwent any orthopedic surgery of the lower extremities during the last two years and other concomitant therapies, except for the use of analgesic and non-steroidal anti-inflammatory drugs, were excluded from the study. From 221 participants, 139 already diagnosed with OA knee who took home-based physiotherapy services from HealthCare atHome, were selected for the observational study (Fig. 1). Before starting the therapy, problems and expectations of the participants were clearly understood, and a goal was set individually, which was documented as part of a standard process of HealthCare atHome.

The whole process of care was also explained and communicated to the patient. All the physiotherapists were trained on taking standard assessment, documenting, and delivering physiotherapy treatment. The study was conducted in accordance with the 1975 Helsinki Declaration principles, as revised in 1996. All the participants provided informed written consent before enrolling in home-based physiotherapy services of HealthCare atHome. All the participants were evaluated for knee pain and disability. Knee pain was assessed using a visual analog scale (VAS) score obtained on each visit. The participants were instructed to use the 0–10-cm scale to indicate their current level of pain. The values (cm) were recorded on each visit to monitor case progression. Pain reduction of 1.75 cm on VAS is recommended as the minimum clinically important difference in osteoarthritis trials[23]. The Western Ontario and Mcmaster Universities Osteoarthritis Index (WOMAC) was used as a patient-reported outcome measure to assess the level of pain, stiffness, and physical function. In the present study, Likert scale version of the WOMAC was used, which allows participants to respond using a five-point scale (0, none; 1, mild; 2, moderate; 3, severe; 4, extreme). Scores were generated for the three dimensions of pain, stiffness, and physical function by adding the coded responses. The patient should answer the questions that best described their symptoms and difficulties for the past 72 h[24]. The WOMAC scores were recorded at initial assessment and every week thereafter. Angst et al.[25] investigated the responsiveness of the WOMAC in participants with OA of the knee and hip. The minimal clinical important difference (MCID) was the percent change in the WOMAC score corresponding to a small change in global rating scale 3 months after physical therapy intervention. The MCID to show improvement was equal to a 17–22% change from baseline. All the outcomes were documented in a HealthCare atHome registered platform patient care system (PCS). The individual supervised home physiotherapy program of 45–50 min was delivered to each patient. The duration and frequency of treatment was decided by the treating physiotherapist based upon acuteness and severity of patient condition. The mean treatment cycle duration was 31.5 days (mean number of sessions delivered, 19.7). The main goals of physiotherapy were to reduce pain and disability in participants with knee OA and delivered in the form of electrotherapy, exercise therapy, and manual therapy. Electrotherapy in the form of transcutaneous electrical nerve stimulation (TENS) was applied using biphasic symmetrical waveform with 100-Hz frequency, 50-µs pulse width, and intensity (mA) set at the patient tolerance level for 20 min[26, 27]. Therapeutic ultrasound was also provided on tender points in pulsed mode with 1-MHz frequency, 0.8–1 W/cm^2 intensity applied with a 5-cm diameter applicator[28, 29]. Both TENS and ultrasound were applied with CE_{0434} certified combo BTL-4000 smart machine (BTL Industries Ltd., Hertfordshire, United Kingdom). Manual therapy in the form of patellar mobilization was also provided to the patellofemoral articulation in a superior to inferior and medial to lateral direction in a pain-free manner for 3–4 min[30]. Exercise therapy in the form of stretching of hip flexors, Iliotibial band, and gastrocnemius was repeated thrice per session. Each stretch was sustained for 30 s, with 10-s rest intervals[12]. Activation of hip abductors, extensors, and external rotators were performed along with activation of hamstrings, vastus medialis obliques (VMO), and core muscles in three sets of 10 repetitions. Exercise was progressed based on progressive resistive exercise using resistance exercise bands and weight cuffs.

Data of 94 females (mean age, 61.7 ± 9.9 years) and 45 males (mean age, 63.8 ± 11.3 years) were analyzed using Wilcoxon signed rank test, and percentage mean change in VAS & WOMAC before and after intervention was observed (Table 1). The significance level α was set to 0.05.

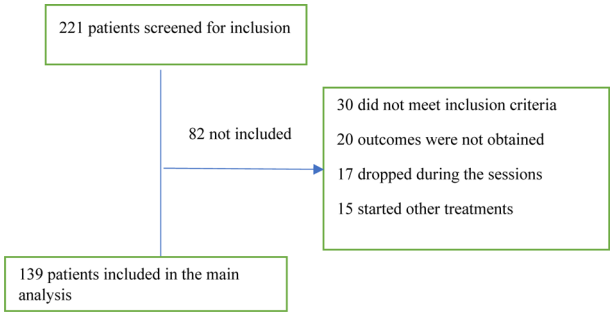

Fig. 1. Consort chart.

RESULTS

Statistically significant improvement in all the outcome measures were observed ($p<0.05$) (Table 2). A reduction of 1.75 cm in VAS has been documented as MCID in osteoarthritis trials[23] and a reduction of 17–22% on WOMAC scores has been reported as MCID in participants with OA of the knee & hip[25]. In present study, the average scores in pain & disability were reduced by 3.1 cm & 43% respectively which is more than MCID documented in previous studies. No statistically significant differences in VAS and WOMAC scores were observed between males and females (Table 3).

DISCUSSION

Physical therapy is the appropriate non-surgical treatment for knee OA. Physiotherapy has been suggested to not only help reduce pain, but also improve function, muscle strength, range of movement (ROM), joint stability, and aerobic conditioning[12, 18, 19]. Regular exercises by patients with knee OA, in a program of intervention through appropriate guidance, can help prevent the loss of muscle strength and restriction of daily activities[31]. In addition, regular exercises can enable pain control and prevent loss of ROM, even when the exercises are performed in the patient's home[32]. Literature also suggests that contact with a therapist may have influenced psychological outlook, leading to improved mental health and reduced anxiety levels. Such an effect has been demonstrated previously following aerobic exercise[33, 34]. Apart from exercise therapy, manual therapy interventions, such as patellar mobilization, offer additional benefit because they stretch the joint capsule, mobilize any restriction within the limits of patient tolerance, and likely loosen adhesions of the patellofemoral articulation[30]. Literature also suggests that mobilization might have stimulated the articular mechanoreceptors, thereby reducing the joint pain by inhibiting the nociceptive input at the spinal level[35]. Same level of hypoalgesia was observed with a pattern like that generated by direct stimulation of the periaqueductal grey matter[35–37]. Weakness of the quadriceps muscle is also considered

Table 1. Patient count, mean age, mean days of service, and mean average number of sessions

	Patient count	Mean age (years)	Days of service	Number of sessions
Total	139	62.4 ± 10.4	31.5	19.7
Female	94	61.7 ± 9.9	33.4	20.4
Male	45	63.8 ± 11.3	27.5	18.3

Table 2. Pre and post mean values of VAS and WOMAC with % improvement

Outcomes	Mean ± SD (Pre)	Mean ± SD (Post)	Improvement	% Improvement
VAS (cm)	5.8 ± 2.2	2.7 ± 2.1	3.0 ± 2.4*	52%
WPS	8.3 ± 4.6	4.9 ± 4.1	3.5 ± 3.6*	42%
WSS	3.0 ± 2.1	1.5 ± 2.0	1.5 ± 1.8*	50%
WFS	25.9 ± 14.5	15.1 ± 12.9	10.8 ± 9.9*	42%
TWS (%)	37.5 ± 20.1	21.5 ± 18.0	16.0 ± 14.4*	43%

VAS: Visual analogue scale; WPS: WOMAC pain score; WSS: WOMAC stiffness score; WFS: WOMAC function score; TWS: total WOMAC score, *Significant difference at $p<0.05$.

Table 3. Pre and post mean values with % improvement in males and females

Outcomes	Mean ± SD (Pre-females)	Mean ± SD (Post-females)	Mean ± SD (Pre-males)	Mean ± SD (Post-males)	% Improvement (Females)	% Improvement (Males)
VAS (cm)	5.7 ± 2.2	2.7 ± 2.0	6.0 ± 2.2	2.9 ± 2.3	53%	51%
WPS	8.4 ± 4.6	4.7 ± 4.0	8.2 ± 4.7	5.2 ± 4.5	44%	36%
WSS	3.0 ± 2.1	1.4 ± 1.9	2.9 ± 2.1	1.7 ± 2.2	54%	42%
WFS	25.6 ± 14.5	14.1 ± 11.6	26.4 ± 13.8	17.0 ± 15.2	45%	36%
TWS (%)	37.0 ± 20.1	20.0 ± 16.1	38.6 ± 19.7	24.6 ± 21.3	46%	36%

VAS: visual analog scale; WPS: WOMAC pain score; WSS: WOMAC stiffness score; WFS: WOMAC function score; TWS: total WOMAC score.

one of the most important risk factors in the progression of knee OA, and because the strength of this muscle decreases with age, leading to functional limitation, the trend towards greater improvements in pain and function in the participants most compliant with the exercise program adds strong evidence for strength gain being the key factor[38, 39]. In present study, the VAS and WOMAC scores in females were more improved than those in males because male patients reported greater pain severity initially (6.0 in males and 5.7 in females). In addition, males reported higher level of disability initially (total WOMAC score: 38.6 in males and 37 in females). Marcus[40] also reported similar findings in his study and concluded that gender differences in patients with chronic pain can be observed in a treatment-seeking population. He also suggested that females were more likely to actively seek methods to remedy pain and seek first-response treatments. Puett et al.[18] conducted a review to investigate the efficacy of nonmedicinal and non-invasive therapies for hip and knee OA. Fifteen controlled trials of diathermy, exercise, acupuncture, transcutaneous electrical nerve stimulation, topically applied capsaicin, low energy laser, and pulsed electromagnetic field were found and analyzed. In the three exercise trials with non-exercise controls, the patients assigned to the exercise groups had greater pain reduction and more improved function than the control groups. The study concluded that exercise reduces pain and disability in patients with knee OA. Data on the other therapies were sparse (TENS, pulsed electromagnetic fields) or inconsistent (acupuncture). Deyle et al.[12] conducted a study to explore the effectiveness of manual physical therapy and exercise in knee OA and reported similar findings. Clinically and statistically, significant improvements in 6-min walk distance and WOMAC score at 4 weeks and 8 weeks were seen in the treatment group but not in the placebo group. At 4 weeks, the mean WOMAC scores were 51.8% ($p<0.05$) and 15.8% lower in the treatment and placebo groups, respectively ($p<0.05$). At 8 weeks, the reduction in WOMAC scores from baseline was 55.8% ($p<0.05$) and 14.6% in the treatment and placebo groups, respectively (p value not significant). The results in present study were in accordance with the findings of study conducted by Deyle et al., as the study revealed similar reduction in VAS and WOMAC scores. Treatment interventions, such as electrotherapy, manual therapy, and exercise therapy used for home-based services by HealthCare atHome, were multimodal as in the study by Deyle et al., who has also explored the combined effect of manual therapy with exercise therapy in his study. The present study had certain limitations, such as the height, weight, and body mass index not being obtained. We were also unable to track the long-term outcome of home-based physiotherapy treatment. Future research should focus on measuring quality of life in terms of tracking overall impact of home-based physiotherapy services. In conclusion, home-based physiotherapy services offered by HealthCare atHome as standardized care with consistent monitoring of outcomes led to significant reduction of average scores in pain and disability in patients with osteoarthritis of knee.

Conflict of Interest

Gaurav Shori, Deputy Manager, Physiotherapy Trainer, HealthCare atHome India Pvt. Ltd. Gagan Kapoor, Head Physiotherapy Services, HealthCare atHome India Pvt. Ltd. Prativa Talukdar, Assistant Manager, Clinical Evaluation Team, HealthCare atHome India, Pvt. Ltd.

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