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Original Article

Effect of Home-Based Supervised Exercise Program on Pain and Functional Disability in Patients with Tennis Elbow

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ABSTRACT

Background: Tennis elbow (lateral elbow tendinopathy) is a degenerative condition resulting from overuse of the common extensor tendon, leading to lateral elbow pain and functional impairment that can last for months. Rehabilitation through exercise, especially progressive loading, is the primary method and proves more effective than passive therapies in enhancing pain and function. There is minimal local evidence; hence, this study assessed a home-based supervised exercise regimen aimed at alleviating pain and disability in tennis elbow. **Methods & Materials:** A cross-sectional observational study was conducted among 50 tennis elbow patients at BIRDEM, Dhaka, in 2025. Participants underwent a 4-week home-based supervised exercise program including stretching, eccentric strengthening, and forearm mobility exercises. Pain and disability were assessed using VAS and PRTEE at baseline and follow-up. Data were analyzed using repeated-measures ANOVA in SPSS version 26.0. **Results:** Fifty patients suffering from tennis elbow finished the study and follow-up. Pain intensity (VAS) significantly reduced from 7.5 ± 1.0 at baseline to 2.1 ± 0.7 by Week 8, and functional disability (PRTEE) enhanced from 58.9 ± 9.6 to 18.3 ± 5.9 (both $p < 0.001$). Exercise adherence was strong in 78% of participants, 88% experienced only mild discomfort at Week 8, and 72% reached significant clinical improvement, reflecting positive results after the supervised home-based exercise program. **Conclusion:** A supervised, structured exercise program at home significantly decreased pain and enhanced functional ability in individuals with tennis elbow, showing strong adherence and positive clinical results. These results endorse its application as a feasible, attainable, and economical conservative therapy choice.

Keywords: *Home-Based Supervised Exercise Program, Pain, Functional Disability, Tennis Elbow.*

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INTRODUCTION

Tennis elbow, also known as lateral epicondylitis or lateral elbow tendinopathy (LET), is a degenerative disorder of the common extensor tendon originating from the lateral epicondyle of the humerus. Despite its name, the condition is not inflammatory in nature. It typically develops gradually as a result of repetitive overuse and is characterized by pain during forearm supination and wrist or finger extension [1,2]. The underlying pathophysiology is characterized by collagen disorganization, increased ground substance, and neovascularization rather than acute inflammation, indicating a tendinosis process. These pathological changes support the use of graded exercise and progressive loading to promote tendon remodeling and improve load tolerance [3,4]. The condition was first described by Runge in 1873, and later termed "Lawn Tennis Arm" by Henry Morris because of its association with repetitive racket sports [5]. Clinically, tennis elbow presents with progressive pain over the lateral aspect of the elbow that is aggravated by gripping, wrist extension, and forearm rotation. The condition frequently limits activities of daily living and occupational tasks, including lifting, writing, typing, and carrying objects. Although symptoms often resolve spontaneously, a considerable proportion of patients experience persistent or recurrent symptoms lasting longer than 6 to 12 months, resulting in reduced quality of life and impaired work productivity [6,7].

Exercise therapy remains the cornerstone of conservative management for lateral elbow tendinopathy. Current evidence supports active rehabilitation as the primary treatment approach, with exercise-based physiotherapy demonstrating superior outcomes in pain reduction and functional improvement compared with passive interventions or placebo treatments [8,9]. Various exercise modalities, including eccentric, concentric-eccentric, isometric, and progressive resistance exercises, have been investigated for the management of LET. Studies suggest that progressive loading programs tailored to individual patient tolerance are more effective than reliance on any single exercise modality. While isometric exercises may provide short-term pain relief, their long-term superiority over other loading strategies remains uncertain [10,11].

Several studies have demonstrated that structured home-based exercise programs are as effective as supervised physiotherapy in reducing pain and improving functional outcomes in patients with lateral epicondylitis. Furthermore, long-term follow-up studies have shown sustained pain relief and functional recovery following home-based isometric exercise programs, with most patients reporting minimal or no pain after 12 months. These findings suggest that structured home-based rehabilitation can serve as an effective and practical alternative to clinic-based supervised therapy [12,13].

In Bangladesh, evidence regarding structured home-based supervised exercise programs for tennis elbow is limited, and long-term outcome data remain scarce. Therefore, this prospective study aims to evaluate the effectiveness of a home-based supervised exercise program in reducing pain and functional disability among patients with tennis elbow. The findings may provide evidence for a cost-effective and accessible rehabilitation strategy that could serve as an alternative to conventional supervised physiotherapy.

METHODS & MATERIALS

Study Design and Setting:

This cross-sectional observational study was conducted in the Department of Physical Medicine and Rehabilitation, Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh, between January to June 2025. The study was designed to evaluate the effectiveness of a home-based supervised exercise program in reducing pain and improving functional disability among patients with clinically diagnosed tennis elbow.

Study Participants and sample size:

The study population consisted of 50 consecutive patients with clinically diagnosed unilateral tennis elbow (lateral epicondylitis) attending the outpatient department. Participants were adults aged 30–50 years with symptom duration ranging from 8 weeks to 6 months who fulfilled the predefined clinical diagnostic criteria for tennis elbow.

Inclusion Criteria:

- Patients aged 30–50 years.
- Clinically diagnosed unilateral tennis elbow (lateral epicondylitis).
- Symptom duration between 8 weeks to 6 months.
- Presence of lateral elbow pain aggravated by gripping activities.
- Pain elicited during resisted wrist extension.
- Pain during passive wrist flexion with the elbow in extension.
- Localized tenderness over the lateral epicondyle.

Exclusion Criteria:

- History of elbow surgery or trauma.
- Presence of cervical radiculopathy.
- Peripheral nerve entrapment involving the upper limb.
- Inflammatory arthritis.
- Neurological disorders affecting the upper limb.
- Corticosteroid injection within the previous 6 months.
- Previous physiotherapy treatment for tennis elbow within the last 3 months.

Intervention

All participants underwent a structured home-based supervised exercise program for four weeks. Before commencing the program, each participant received individualized instruction and demonstration from a physiotherapist and was provided with written exercise guidelines to ensure correct exercise performance at home.

The workout routine included static stretching for the wrist extensor muscles by carefully flexing the wrist while keeping the elbow straight, followed by eccentric strengthening exercises that required controlled descent of the wrist from an extended state. Furthermore, exercises for supination and pronation were conducted to enhance forearm mobility, strength of muscles, and functional recovery in individuals with tennis elbow.

Static stretching for tennis elbow involves extending the affected arm with the elbow straight and palm facing downward. Using the opposite hand, the wrist is gently bent into flexion until a stretch is felt along the outer forearm. The stretch is held for 20–30 seconds and repeated 3–5 times, avoiding pain or bouncing movements. This helps reduce muscle tightness, improve flexibility, and support recovery.

Eccentric strengthening for tennis elbow involves slowly lowering the wrist from an extended position using the affected arm while controlling the movement. The forearm is supported with the palm facing downward, and the wrist is raised with the opposite hand before gradual lowering. It is performed for 10–15 repetitions per set to improve tendon strength, reduce pain, and enhance function.

Supination–pronation exercise for tennis elbow involves rotating the forearm to improve flexibility and strength of the wrist and forearm muscles. The patient keeps the elbow bent at 90° and close to the body while holding a light weight or hammer. The forearm is slowly rotated from palm-up (supination) to palm-down (pronation) and back in a controlled manner. It is performed for 10–15 repetitions to improve forearm mobility, reduce stiffness, and enhance functional recovery.

Participants performed the prescribed exercises at home five days per week for four consecutive weeks. They attended the department once weekly for supervision, correction of exercise technique, adjustment of exercise intensity, and review of their exercise diary to monitor compliance. In addition, ergonomic advice and recommendations regarding activity modification were provided throughout the intervention period.

Outcome Measures

Participants were evaluated at baseline and at Weeks 2, 4, and 8. Pain intensity was assessed using the Visual Analogue Scale (VAS), a 10-cm scale ranging from 0 (no pain) to 10 (worst imaginable pain). Functional disability was evaluated using the Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire, with higher scores indicating greater pain and disability.

Exercise compliance was assessed using participants' exercise diaries and categorized as excellent (≥90% of prescribed sessions completed), good (75–89%), or fair (<75%). Overall clinical improvement was classified according to the percentage reduction in PRTEE score from baseline as marked (>50% reduction), moderate (25–50% reduction), or minimal (<25% reduction).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD), whereas categorical variables were expressed as frequencies and percentages. Changes in VAS and PRTEE scores over time were analyzed using repeated-measures analysis of variance (ANOVA) with Bonferroni-adjusted post hoc comparisons. A two-tailed p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 50 patients were assessed for eligibility during the study period. Of these, six patients were excluded because they did not meet the inclusion criteria (n = 4) or declined to participate (n = 2). Finally, 50 patients with clinically diagnosed tennis elbow were enrolled and completed both the 4-week home-based supervised exercise program and the 8-week follow-up assessment. No participant was lost to follow-up.

Baseline characteristics

Table I presents the baseline sociodemographic and clinical characteristics of the participants. The mean age was 40.1 ± 5.4 years, with the largest proportion (32.0%) belonging to the 36–40-year age group. Male participants constituted 62.0% of the study population. Office workers were the most common occupational group (38.0%), followed by manual workers (24.0%), teachers (20.0%), and homemakers (18.0%). The dominant upper limb was affected in 74.0% of participants. The mean duration of symptoms before enrollment was 10.8 ± 2.3 weeks. At baseline, participants had considerable pain and disability, with mean VAS and PRTEE scores of 7.5 ± 1.0 and 58.9 ± 9.6, respectively.

Table I
Baseline sociodemographic and clinical characteristics of the participants (*n* = 50)

Variable	Value
Age (years), Mean ± SD	40.1 ± 5.4
Age group, n (%)	
30–35 years	10 (20.0)
36–40 years	16 (32.0)
41–45 years	15 (30.0)
46–50 years	9 (18.0)
Sex, n (%)	
Male	31 (62.0)
Female	19 (38.0)
Occupation, n (%)	
Office worker	19 (38.0)
Teacher	10 (20.0)
Homemaker	9 (18.0)
Manual worker	12 (24.0)
Affected side, n (%)	
Dominant limb	37 (74.0)
Non-dominant limb	13 (26.0)
Duration of symptoms (weeks), Mean ± SD	10.8 ± 2.3
Baseline VAS score, Mean ± SD	7.5 ± 1.0
Baseline PRTEE score, Mean ± SD	58.9 ± 9.6

Changes in pain intensity
Table II shows the changes in pain intensity measured by the Visual Analogue Scale (VAS) over the study period. The mean VAS score decreased progressively from 7.5 ± 1.0 at baseline to 5.4 ± 0.9 at Week 2, 3.0 ± 0.8 at Week 4, and 2.1 ± 0.7 at Week 8. Compared with baseline, the mean reductions in VAS score were 2.1, 4.5, and 5.4 points at Weeks 2, 4, and 8, respectively. Repeated-measures ANOVA demonstrated a statistically significant reduction in pain across all follow-up assessments ($p < 0.001$).

Table II
Changes in pain intensity (VAS) following the home-based supervised exercise program (*n* = 50).

Assessment time	Mean ± SD	Mean Difference from Baseline	p-value*
Baseline	7.5 ± 1.0	—	—
Week 2	5.4 ± 0.9	2.1	<0.001
Week 4	3.0 ± 0.8	4.5	<0.001
Week 8	2.1 ± 0.7	5.4	<0.001

**Repeated Measures ANOVA with post-hoc comparison.*

Changes in functional disability
Table III summarizes the changes in functional disability assessed using the Patient-Rated Tennis Elbow Evaluation (PRTEE). The mean PRTEE score decreased steadily from 58.9 ± 9.6 at baseline to 44.7 ± 8.1 at Week 2, 27.9 ± 6.5 at Week 4, and 18.3 ± 5.9 at Week 8. The corresponding mean reductions from baseline were 14.2, 31.0, and 40.6 points, respectively. Repeated-measures ANOVA showed that the improvement in functional disability over time was highly statistically significant ($p < 0.001$).

Table III
Changes in functional disability (PRTEE score) following the home-based supervised exercise program (*n* = 50).

Assessment time	Mean ± SD	Mean Difference from Baseline	p-value*
Baseline	58.9 ± 9.6	—	—
Week 2	44.7 ± 8.1	14.2	<0.001
Week 4	27.9 ± 6.5	31.0	<0.001
Week 8	18.3 ± 5.9	40.6	<0.001

**Repeated Measures ANOVA with post-hoc comparison.*

Overall treatment outcome
Table IV presents participants' compliance with the prescribed exercise program and overall treatment outcomes at the end of follow-up. Most participants (78.0%) demonstrated excellent adherence by completing at least 90% of the prescribed exercise sessions, whereas 16.0% showed good compliance and 6.0% had fair compliance. At Week 8, 88.0% of participants reported only mild pain (VAS 0–3), while the remaining 12.0% experienced moderate pain; none reported severe pain. Overall, 72.0% of participants achieved marked clinical improvement, 22.0% showed moderate improvement, and 6.0% demonstrated minimal improvement.

Table IV
Overall treatment outcome after completion of the exercise program (n = 50).

Variable	n (%)
Exercise compliance	
Excellent (≥90% prescribed sessions)	39 (78.0)
Good (75–89%)	8 (16.0)
Fair (<75%)	3 (6.0)
Pain severity at Week 8	
Mild (VAS 0–3)	44 (88.0)
Moderate (VAS 4–6)	6 (12.0)
Severe (VAS 7–10)	0 (0.0)
Overall clinical improvement	
Marked improvement	36 (72.0)
Moderate improvement	11 (22.0)
Minimal improvement	3 (6.0)

DISCUSSION

The current study revealed significant initial pain and disability in upper-limb musculoskeletal issues, primarily impacting the dominant arm, with an average duration of 10 weeks, indicating considerable functional limitation likely associated with repetitive work-related tasks. These results are backed by evidence showing that rehabilitation through exercise is effective; a randomized controlled trial indicated that home-based elbow exercises alleviated pain and disability and enhanced function, while another study on chronic lateral elbow tendinopathy demonstrated that supervised graded exercise markedly improved pain and functional outcomes via progressive loading. In general, both investigations endorse exercise therapy for musculoskeletal issues of the upper limb [14,15].

In the current research, VAS pain scores showed a notable decline from 7.5 ± 1.0 at baseline to 5.4 ± 0.9 at Week 2, 3.0 ± 0.8 at Week 4, and 2.1 ± 0.7 at Week 8, indicating a steady reduction in pain through the home-based supervised exercise program. A systematic review and meta-analysis back this conclusion, indicating that exercise interventions outperform passive treatments in enhancing pain relief and function for lateral elbow tendinopathy, despite small effect sizes, which emphasizes the importance of organized exercise programs [16].

Functional disability assessed by PRTEE showed significant improvement after the 8-week exercise program, with scores decreasing from 58.9 ± 9.6 at baseline to 18.3 ± 5.9 at Week 8. This improvement suggests reduced disability and enhanced function, consistent with previous evidence that eccentric and graded strengthening exercises improve tendon adaptation, muscle strength, and functional recovery in lateral epicondylitis [17].

In this study, 78% of participants showed excellent adherence, with 88% reporting mild pain and 72% achieving substantial clinical improvement at Week 8. These findings support previous evidence that progressive loading and supervised exercise programs effectively improve pain and function in lateral elbow tendinopathy [17,18]. The results indicate that a well-organized home-based supervised exercise regimen effectively alleviates pain and functional disability while attaining high compliance and significant clinical progress in upper-limb musculoskeletal issues.

CONCLUSION

The findings of this study suggest that a structured home-based supervised exercise program is effective in reducing pain and improving functional disability in patients with tennis elbow. Participants demonstrated significant reductions in both Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) scores over the 8-week follow-up period, indicating sustained clinical improvement. High exercise adherence and the absence of severe pain at the final assessment further support the feasibility and acceptability of the intervention. A home-based supervised exercise program may therefore represent a practical, accessible, and cost-effective conservative treatment option for patients with tennis elbow, particularly in settings with limited access to regular supervised physiotherapy. Further randomized controlled trials with larger sample sizes and longer follow-up periods are recommended to confirm these findings and evaluate long-term outcomes.

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