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Clinical effectiveness of treating lower back pain through traditional manual therapy

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Running Title: Manual Therapy and Lumbar Alignment

Objective: This study was aimed to assess the clinical outcomes of traditional manual therapy. **Methods:** Patients between 16–70 years of age with lower back pain received a 10-day course of rhythmical vibration based traditional manual therapy. Scoliosis angle, vertebral rotation, and intervertebral space were measured pre- and post-treatment using goniometry and radiographic analysis. **Results:** Significant improvements were observed in all assessments after therapy ($p < 0.001$). The average scoliosis angle increased by 1 – 2 degrees, vertebral rotation decreased by 2 – 4 mm while intervertebral space expanded by 1.2 – 1.6 mm, indicating improved spinal symmetry. **Conclusions:** Traditional manual therapy demonstrated measurable radiographic improvements in spinal alignment and intervertebral spacing, suggesting its clinical potential in managing in lower back pain through non-invasive correction of musculoskeletal dysfunctions.

Keywords: Manual therapy, Lower back pain, Spine, Radiography

Introduction

Low back pain is one of the most common musculoskeletal disorders worldwide and a leading cause of disability across all age groups. According to the Global Burden of Disease 2010 report, it is among the top contributors to years lived with disability globally.[1,2] Acute and recurrent low back pain not only imposes a substantial health burden but also results in high economic costs due to diagnostic procedures, analgesic use, and prolonged treatment.[3-6] The condition arises from both acute injuries and long-term inactivity, which can cause muscle stiffness, restricted joint mobility, and subsequent neurological involvement.[7-10] Although modern imaging techniques are valuable for identifying structural abnormalities, they often fail to capture functional changes.[11] Therefore, clinical evaluation methods such as palpation and assessment of range of motion remain essential for diagnosis.[12]

Various therapeutic approaches, including massage,[13] acupuncture,[14] physiotherapy,[15] topical applications,[16] and balneotherapy,[17] are widely used to relieve pain and restore function. However, there is limited evidence on standardized treatment plans, optimal duration

of therapy, and their comparative effectiveness, particularly in our national context where epidemiological data on low back pain are lacking.

Therefore, this study aimed to evaluate the radiographic effects of rhythmical vibration based manual therapy on patients with lower back pain, specifically assessing changes in spinal scoliosis, vertebral rotation, and intervertebral spacing before and after treatment.

Material and Methods

This pre-post interventional study was conducted at a tertiary traditional hospital. A total of 200 patients (100 men and 100 women), aged 16-70 years, were enrolled in the study. Baseline demographic information, including age, sex, body mass index (BMI), was recorded; BMI was collected only once at baseline for descriptive purposes and was not used as a treatment outcome.

Eligibility Criteria

Inclusion criteria: Patients whose diagnosis of low back pain was confirmed by physical examination and X-ray, and who completed the prescribed treatment.

Exclusion criteria: Patients diagnosed with infectious or non-communicable comorbidities, those resistant to or regularly using analgesics, those with contraindications to participation, and those with a history of spinal surgery or other related procedures.

Diagnostic and Treatment Procedures

Diagnoses were established by experienced traditional medicine practitioners and radiologists, each with more than 10 years of professional practice. Treatments were administered using rhythmical vibration based traditional manual therapy techniques for 10 days. Outcomes were assessed by measuring lumbar joint angles with a goniometer on pre- and post-treatment radiographs.

Quantitative Measurements

TRadiographic analyses assessed scoliosis (angular deviation), vertebral rotation, and intervertebral space reduction. Standardized radiographs covering at least 50% of the lumbar region were obtained in both anteroposterior and lateral views.

Statistical Analysis

Statistical analysis was performed using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). Data distribution was assessed with the Shapiro–Wilk test. Descriptive statistics, including mean, standard deviation (SD), and standard error, were calculated for demographic variables (age, sex, height, weight, and body mass index). Pre- and post-treatment outcomes were obtained from the same individuals; therefore, within-group comparisons were conducted using paired t-tests. Male and female patients were analyzed as separate independent groups. Arithmetic means and 95% confidence intervals were reported for all outcome variables, and a p-value < 0.05 was considered statistically significant.

Ethical Considerations

This study was reviewed and approved by the Otoch Manramba University Ethics Committee (No. 2019.16) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants after they were fully informed of the study objectives and procedures. There were no conflicts of interest or external pressures influencing diagnosis or treatment.

Results

Participant Characteristics

A total of 200 patients (100 men and 100 women) aged 16-70 years participated in the study. The mean age was 39.2 ± 12.6 years, with most participants (61%) between 31 and 50 years old (Table 1). Baseline demographic characteristics showed a balanced gender distribution and a representative adult age range suitable for evaluating lower back pain. Subsequent analyses focused on differences in pre- and post-treatment outcomes to assess the clinical effects of traditional manual therapy.

Participant Characteristics

The mean body mass index (BMI) of all participants was 26.9 ± 4.5, indicating that most patients were in the overweight range. The average BMI among men (27.1) was slightly higher than that of women (26.4), and this difference was statistically significant at $p = 0.023$ (Table 2).

Table 1. Demographic distribution of respondents by age and sex

Age group	Female (n, %)	Male (n, %)	Total (n, %)
>20	15 (15%)	9 (9%)	24 (12.0%)
21 – 25	3 (3%)	6 (6%)	9 (4.5%)
26 – 30	6 (6%)	5 (5%)	11 (5.5%)
31 – 35	12 (12%)	16 (16%)	28 (14.0%)
36 – 40	13 (13%)	22 (22%)	35 (17.5%)
41 – 45	18 (18%)	18 (18%)	36 (18.0%)
46 – 50	14 (14%)	9 (9%)	23 (11.5%)
51 – 55	6 (6%)	7 (7%)	13 (6.5%)
56 – 60	6 (6%)	4 (4%)	10 (5.0%)
61>	7 (7%)	4 (4%)	11 (5.5%)
Total	100 (100%)	100 (100%)	200 (100%)
Average age	39.7 ± 16.7	38.7 ± 11.4	39.2 ± 12.6
95% CI	36.9 – 42.3	36.5 – 41.0	37.4 – 40.9

Table 2. Body mass index (BMI) of respondents by sex

Variables	BMI		* *p*-value
	Mean	95% CI	
Male	27.1 ± 4.4	26.5 – 28.3	
Female	26.4 ± 4.6	25.5 – 27.3	
Total	26.9 ± 4.5	26.3 – 27.5	0.023

** One-sample T-test*

Radiographic Measurements Before and After Treatment

Table 3 shows the radiographic measurements of spinal alignment before and after treatment. A statistically significant improvement ($p< 0.001$) was observed in all measured parameters among both male and female participants. In men, the mean scoliosis angle improved from 177.5 ± 26.0° before treatment to 179.6 ± 14.0° after treatment. In women, it improved from 178.3 ± 18.0° to 179.3± 7.0°, indicating a more aligned vertical orientation of the vertebrae. For the rotation, in men, the mean rotation decreased from 1.7 ± 2.0 cm to 1.9 ± 1.0 cm, and in women, from 1.5 ± 2.0 cm to 1.9 ± 1.0 cm. These

Table 3. Radiographic measurements of spinal changes before and after traditional manual therapy.

Parameter	Sex	Before treatment Mean ± SD	95% CI	After treatment Mean ± SD	95% CI	* *p*-value
Scoliosis (°)	M	177.5 ± 2.6	176.9–178.0	179.6 ± 1.4	179.2–179.6	0.000
	F	178.3 ± 1.8	178.6–177.9	179.3 ± 0.7	179.5–179.8	0.000
Rotation (cm)	M	1.7 ± 0.2	1.6–1.7	1.9 ± 0.1	1.9–2.0	0.000
	F	1.5 ± 0.2	1.5–1.4	1.9 ± 0.1	1.9–2.0	0.000
Intervertebral space (cm)	M	0.82 ± 0.1	0.84–0.80	0.98 ± 0.04	0.99–0.97	0.000
	F	0.86 ± 0.1	0.88–0.84	0.98 ± 0.04	0.98–0.97	0.000

** Paired T-test*

results suggest improved mobility and reduced asymmetry of the spinal segments. Lastly, the mean intervertebral joint space increased from 0.82 ± 1.0 cm to 0.98 ± 0.4 cm in men, and from 0.86 ± 1.0 cm to 0.98 ± 0.4 cm in women. This indicates a recovery of normal joint spacing following treatment.

Discussion

TIn general disease diagnosis involves three major approaches such as observation, palpation, and questioning, whereas traditional manual therapy differs from other treatments in that it relies on a distinctive method of touch and tactile examination to determine therapeutic intervention. In this system, it is especially important to evaluate movement reserve, range of motion, and structural function of the musculoskeletal system. Sometimes, limitation in movement can be detected during palpation even when no clear abnormality appears on radiographs.[11] Because the movement reserve is closely related to muscle and tendon conditions, its loss is referred to as a primary dysfunction of the musculoskeletal system in manual therapy.[18] Such primary loss can lead to muscle contraction, joint restriction, and asymmetry of the spine, reducing the intervertebral space and ultimately causing pain, stiffness, and curvature. The lumbar spine, which supports the body's upper weight during standing, walking, and bending, is particularly prone to these degenerative changes.

In our study, many patients were classified as overweight based on BMI. This finding is consistent with earlier studies showing that excess body weight increases lumbar load and accelerates degenerative changes in the lower back.[19,20] Overweight individuals often experience chronic mechanical stress and reduced flexibility of supporting muscles, which may explain the high incidence of back pain observed in our participants. Therefore, management of body weight should be considered a crucial preventive measure in lower back pain therapy.

Lower back pain is not merely a localized spinal problem. It is often associated with S-shaped curvature and vertebral rotation caused by imbalance in the lumbar vertebrae.[21,22] While spinal surgery is preferred treatment in some countries such as Turkey[23] and Korea[24], other research suggests that manual therapy and massage can shorten the duration and frequency of pain episodes.[13,23,25] However, few studies have tracked long-term clinical outcomes or evaluated structural correction following therapy. Some reports have focused on measuring pain intensity or relief after acupuncture and other modalities[14], highlighting the extent to which lower back pain disrupts daily functioning. Our findings, however, indicate that pain relief alone does not represent complete recovery, rather manual therapy can directly correct the underlying structural and functional disturbances responsible for recurring symptoms.

Similar studies from Singapore and China have assessed muscle spasm and tension using sports massage and muscles tension measurement devices, but did not include radiographic evaluation of spinal structure.[25,26] In contrast, our study demonstrated significant radiographic improvement in scoliosis angle (1 – 2 degrees), vertebral rotation (2 – 4 mm), and intervertebral spacing (1.2 – 1.6 mm) after treatment, confirming that traditional manual therapy restores normal alignment and mobility of the spine (Figure 1 and 2). While massage and vibration instruments have been developed in modern practice, they cannot replicate the precision, adaptability, and sensory feedback of manual techniques performed by trained practitioners. Traditional rhythmical vibration-based manual therapy allows the practitioner to dynamically adjust force, direction, and rhythm according to the patient's body condition, a level of clinical judgment that devices cannot provide. Therefore, for addressing spinal asymmetry and restoring movement reserve, the traditional manual therapy remains effective.

This study is limited by the absence of a control group and short-term evaluation period, which restrict causal inference and assessment of long-term effects. Future studies should adopt controlled longitudinal designs with quantitative assessments of movement and muscle function to further clarify the mechanisms and durability of traditional manual therapy.

Conclusion

Rhythmical vibration based traditional manual therapy was found be effective for improving postural balance and reducing pain in patients with low back pain.

Conflict of Interest

The authors state no conflict of interest.

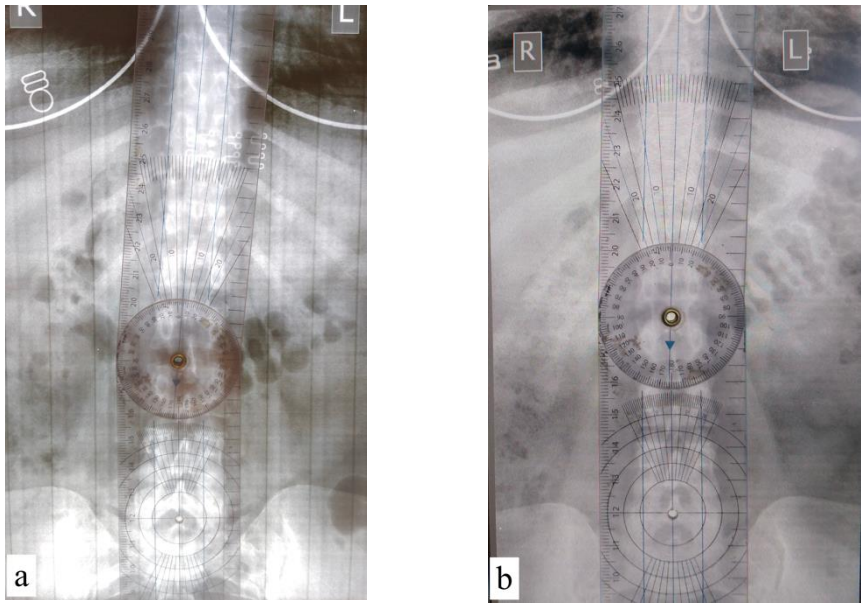

Figure 1. Radiographic images of the lumbar spine before and after traditional manual therapy. (a) Anteroposterior (front) view prior to treatment showing abnormal curvature and vertebral misalignment, (b) anteroposterior view after 10 days of therapy demonstrating improved spinal alignment.

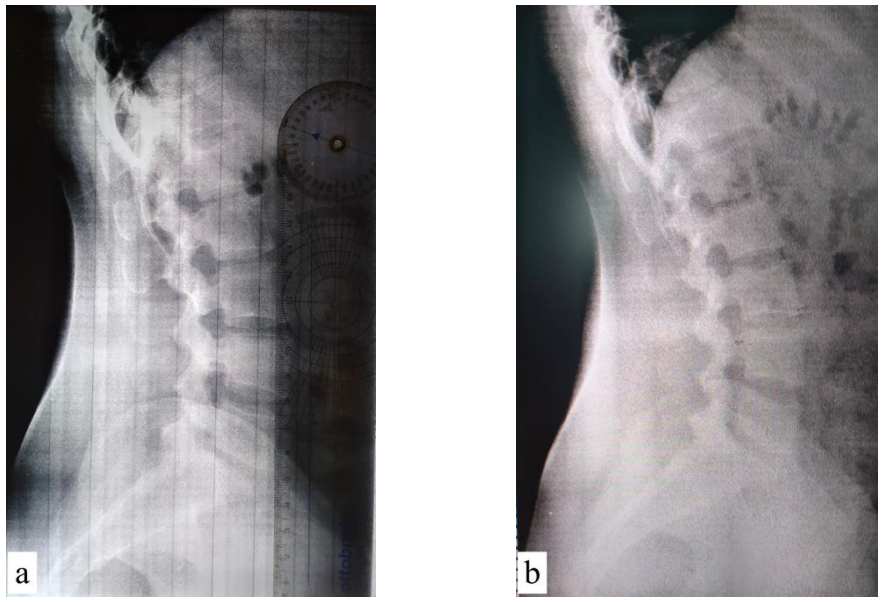

Figure 2. Radiographic images of the lumbar spine before and after traditional manual therapy. (a) Lateral (side) view before treatment indicating reduced vertebral angle and intervertebral narrowing, (b) Lateral view after treatment showing correction of curvature and increased intervertebral spacing.

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Authors Contribution

Molor Radnaabazar: ORCID https://orcid.org/0009-0000-6313-6667, Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing-original draft, writing-review and editing.

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