EFFECT OF MCKENZIE TECHNIQUE ON FEMALES WITH DOWAGER’S HUMP: A RANDOMIZED CONTROLLED STUDY

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ABSTRACT

Purpose: The goal of this study was to investigate the effect of the McKenzie technique on pain intensity level, neck functional disability and absolute rotatory angle (ARA) in female patients with a Dowager’s hump in the lower cervical and thoracic region.

Methods: 30 female patients with Dowager’s hump aged from 38-59 years were randomly distributed to 2 groups. Group A (control) consisted of 15 female patients who received conventional physiotherapy program. Group B (study) consisted of 15 female patients who received conventional therapy as well as McKenzie exercises. The treatment was conducted 3 times a week for 8 weeks. Pain intensity level, neck functional ability and absolute rotatory angle were measured pre-treatment and post 8 weeks of therapy.

Results: When compared to the control group, the study group (group B) showed a statistically significant decrease in pain intensity and neck disability. In addition, the study group demonstrated a statistically significant increase in the absolute rotatory angle of the cervical region.

Conclusion: The Mckenzie technique is very effective and safe for patients with Dowager’s hump as it improves cervical lordosis, neck pain and increases functional neck ability.

Key words: McKenzie technique, Dowager’s hump, Absolute Rotatory Angle (ARA), Neck Disability Index (NDI), Visual Analogue Scale (VAS).

I-INTRODUCTION

Dowager's hump (hyper-kyphosis) is an abnormal outward curvature of the lower cervical and upper thoracic vertebrae in upper back which leads to the compression or wedging of the anterior portion of certain thoracic vertebrae. Hyperkyphosis is commonly reported in post-menopausal women due to associated osteoporosis. The curvature results in the forward bending of the spine (hyperkyphosis) and the formation of a hump at cervicothoracic junction and upper thoracic area ¹. Kyphosis is linked to a change in vertebral body form (anterior wedging), as well as decreased bone density and fitness, in addition to decreased muscle strength, and is associated with lower overall mortality rate. The prevalence of Dowager's hump is 20-40% worldwide ².

As the different regions of the spinal column are connected and one region exerts an impact over another, the effect of an accentuated thoracic curvature is reflected in the cervical spine as a compensatory hyper-extension motion that occurs to keep the normal forward gaze. The adjustments in the cervical region in addition to deformity causes an alteration in the spinal sagittal alignment over the lifespan of the individual ³,⁴.

Similarly, because Dowager's hump can result in lower cervical spine hyper lordosis, abnormalities in the cervical spine may also contribute to the formation of Dowager's hump. This causes an abnormal forward head posture by causing an extended upper cervical spine and a flexed lower cervical spine (FHP) ⁵. Both hyperkyphosis of the region and abnormal head posture can produce neck and back pain, muscle spasm, joint fixation, arthritis, nerve root compression, all of these can a result in alterations of the normal movement patterns and development of more spinal abnormalities ⁶.

The Cobb and Tangent methods are the most commonly used approaches for measuring the cervical lordosis. Although both methods are reliable, it is important to note that the tangent approach provides a reduced measurement standard error than the Cobb method, resulting in more accurate measurement. The posterior method is also more precise in demonstrating cervical curves and can provide analysis of buckled areas ⁷. Thus, in this study, the posterior method...
tangent method was used. The normal cervical lordotic angle is between 31° -40°. So when absolute rotatory angle is below 20° which makes the lordotic curve becomes straighter 8.

Neck retraction is utilized in the McKenzie technique to relieve neck pain caused by spinal or postural problems. This is performed by moving the head and neck posteriorly directly over the thorax while keeping the head and eyes level. Neck retraction may also increase cervical range of motion, correct neck posture, reduce neck or referred pain, anteriorly reposition the nucleus pulposus, and avoid pain recurrence 9.

The McKenzie technique was utilized in the form of a loading strategy which incorporates a centralizing phenomenon; that is addressed as a rapid change in pain location from a distal to a more proximal site. This technique works by allowing lower cervical region extension to alleviate stress on posterior annulus, thus relieving neck pain and improving Quality of Life (QOL). Also repeated neck retraction was recorded to gain significant improvement of peripheral pain and improve nerve root compression 10. Patients with chronic neck pain, head and shoulder posture improved significantly after performing the McKenzie exercise. Furthermore, the patients reported improved function and positional change 11.

The Dowager's hump of the lower cervical and upper thoracic region has received little attention as a postural and structural problem affecting primarily females as a result of menopausal changes. Therefore, the current study will explore the effect of the McKenzie technique on postural and cervical curve correction, as well as pain and functional neck ability.

II- MATERIALS & METHODS

This research is a randomized clinical trial. The Ethical Committee of Cairo University's Faculty of Physical Therapy approved this clinical trial (P.T.REC/012/001757). This study was conducted at ELKASR ELAINY hospital, during the period of September 2018 to March 2019, participants were randomly allocated into equal two subgroups by envelopes. Procedures and guidelines were presented to all participants prior to the study. Subjects who were eligible for the study and agreed to participate signed an institutionally approved consent form. G*Power 3.1 software was used to calculate the power of the study. The F-test MANOVA within and between interaction effects was chosen. With a total sample size of 30 subjects, the type I error (2 tailed) was 0.05 and the effect size was 1.13.

- **Participants**

  The study included 30 female patients with dowager's hump ranging in age from 38 to 59 years old. All patients were diagnosed and referred from orthopedist at Elkasr Elainy hospital, they presented with neck pain radiating to the upper limb (pain intensity level more than 3) and limited all cervical range of motions. Height and weight were assessed and recorded as anthropometric parameters. Variables were measured both before and after the protocol (pre-test and post-test). The inclusion criteria were as follows: (1) neck disability index (NDI) of 20% or more. (2) the ARA is less than 20 degrees. (3) BMI was within 25-30 kg/m². (4) pain intensity level more than 3 on VAS. Exclusion criteria were as follows; (1) previous neck surgeries. (2) cervical trauma or car accident. (3) Neurological infection. (4) spinal cord injury. (4) congenital musculoskeletal deformities or ankylosing spondylitis.

  Patients in the study were randomly assigned to one of two groups (A&B), with group A receiving conventional physical treatment and group B receiving conventional physical therapy plus McKenzie exercises. The two groups were given three sessions per week for eight weeks.

- **Procedures**

  1) For all groups, pain intensity level was assessed using a visual analogue scale (VAS). The line was drawn from 0 (no pain) to 10 (unbearable pain) and the patients picked a number to indicate their pain level. Patients with VAS greater than 3 were included 12. In clinical research, VAS is used to assess the severity or frequency of a range of clinical symptoms. As an outcome measure in randomized controlled trials, VAS is commonly used to gauge therapy success 13.

  2) To assess neck function disability, the NDI is a 10-item questionnaire that assesses a patient's self-reported neck pain-related impairment, was utilized. Personal care, lifting, reading, work, driving, sleeping, recreational
activities, pain severity, concentration, and headache are among the sections included in the questionnaire. Each question is graded on a scale of 0 (no disability) to 5 (extreme disability) \(^{14}\). It is defined as 0-20% mild impairment, 21-40% moderate disability, 41-60% severe disability, 61-80% crippled, and 81-100% bed confined \(^{15}\), patients who had neck disability more than 20% were included in the study \(^{12}\). The NDI-Arabic version has two-factor including ten item structure which ensured as a reliable, valid and responsive used questionnaire for assessing painful neck across Arabic-speaking populations \(^{16}\).

3) Patients were requested to stand up in their usual position, and lateral X-rays were taken. Drawn posterior tangents at each posterior vertebral body boundary from C2 to C7. The slopes along the curve are known as posterior tangents and they can be used to analyze any buckling areas of the cervical curve \(^{8}\). Figure (2) depicts the angle created by the intersection of a vertically downward line drawn from the posterior vertebral body of C2 and a vertically upward line drawn from the posterior vertebral body of C7 \(^{17}\), after measuring the ARA manually, the patients who had ARA less than 200 included in the study \(^{7}\).

![Flow chart detailing the study.](image-url)

**Figure 1.** Flow chart detailing the study.
Figure 2. Posterior tangent method measuring ARA.

- **Group A (control):** 15 female patients received conventional treatment program (upper back extension exercise from prone then sitting position as a strengthening exercise 10 repetition for 3 sets also relaxation time 20 sec between every set, abdominal isometric exercise for 10 repetition 3 sets and relaxation time 20 second between every set, pectoral stretching exercises for 30 second every time for 3 sets )\(^\text{18}\). The program was applied for 3 sessions per week along 8 weeks.

- **Group B (Study):** 15 female patient received conventional PT Program as group (A) in addition to McKenzie exercises through 3 sessions per week for eight 8 weeks. McKenzie exercises were as follows:

1) Retraction in supine position, With the patient's chin in a retracted position and the therapist supporting the patient's head out of bed, perform the exercise 10 to 15 times.

2) Retraction in sitting position, the patient draws her head back as far as she can while keeping her head in a horizontal line; this exercise is repeated 10 to 15 times.

3) Retraction with overpressure, as in prior exercise, the patient must press on her chin to the end of movement, exercise is repeated 10 to 15 repetitions.

4) Retraction with therapist overpressure, similarly to the preceding exercise, the therapist applies pressure to the patient's chin from 5 to 6 repetitions as shown in figure (3).

5) Retraction with extension, While the patient's head is retracted, she moves her head backward to look up at the ceiling; this exercise is repeated 10 to 15 times.

6) Retraction with rotation. In this exercise, the patient retracts her head and rotates it to the uncomfortable side for 10 to 15 repetitions.

7) Rotation with patient overpressure, as in the previous exercise However, the patient applies pressure to her chin towards the end of the exercise for 5to6 repetitions.

8) Rotation with therapist overpressure, as in the last exercise However, from 5 to 6 repetitions, the therapist applies pressure to the patient’s chin.

9) Retraction with Lateral flexion, the patient retracts her head then bend her neck to the painful side from 10 to 15 rep.

10) Lateral flexion with patient overpressure, as previous ex. But make pressure to her chin from 5 to 6 rep. then relax every time.
11) Lateral flexion therapist overpressure, as previous ex. but therapist make pressure to patient’s chin from 5 to 6 rep. then relax every time figure (4).

**Figure 4.** Lateral flexion with therapist overpressure.

- **Statistical analysis:**

Data were analyzed using SPSS for windows, version 18 (SPSS, Inc., Chicago, IL). Descriptive analyses were done to compare demographic data (age, weight, height and BMI) for all patients using independent T test. 2 x 2 mixed design MANOVA. Differences between pre & post treatment for each dependent factor underwent analyzed within and in between both trial groups using multiple pair wise composition test. Level of significance was 0.05.

**III- RESULTS**

The independent t test demonstrated that there were no significant differences (p>0.05) in the mean values of participants' age, weight, height, and BMI between the two study groups as shown in table (1).

<table>
<thead>
<tr>
<th>Items</th>
<th>Group A</th>
<th>Group B</th>
<th>Comparison</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>t-value</td>
<td>P-value</td>
</tr>
<tr>
<td></td>
<td>46.46±6.58</td>
<td>46.73±7.65</td>
<td>-0.102</td>
<td>0.919  NS</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>79.73±7.01</td>
<td>78.06±5.56</td>
<td>0.721</td>
<td>0.477  NS</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>164.13±5.04</td>
<td>165.33±5.77</td>
<td>-0.606</td>
<td>0.549  NS</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>29.02±3.1</td>
<td>28.68±2.56</td>
<td>0.324</td>
<td>0.749  NS</td>
</tr>
</tbody>
</table>

**1) Visual Analogue Scale (VAS):** Within-group comparison is reported in table (2).

Within group's comparison VAS mean ± SD values in the "pre" & "post" tests were 8.03 ±0.85 and 7.53±0.95, respectively control (A). Multiple pairwise comparison tests (Post hoc tests) indicated no significant difference at post treatment in compared to pre-ones (P-value =0.334). While the mean± SD values in the "pre" &"post" tests were 8.56±0.7 and 3.26 ±1.03, respectively in study (B). Multiple pairwise comparison tests (Post hoc tests) reported significant reduction of VAS at post treatment in compared to pre-ones (P-value =0.0001*).

<table>
<thead>
<tr>
<th>VAS</th>
<th>Pre test</th>
<th>Post test</th>
<th>MD</th>
<th>% Of change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>8.03 ±0.85</td>
<td>7.53±0.95</td>
<td>0.50</td>
<td>6.2</td>
<td>0.334</td>
</tr>
<tr>
<td>Group B</td>
<td>8.56±0.7</td>
<td>3.26 ±1.03</td>
<td>5.3</td>
<td>61.9</td>
<td>0.0001*</td>
</tr>
<tr>
<td>MD</td>
<td>0.53</td>
<td>-4.27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p- value</td>
<td>0.088</td>
<td>0.0001*</td>
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</table>

*Significant level is set at alpha level <0.05
MD: Mean difference
SD: standard deviation
p-value: probability value
2) Neck Disability Index (NDI):

As represented in table (3) within the group's comparison the NDI mean ± SD values of ND in the "pre" & "post" tests were 30.12 ±3.88 and 28.18±3.63, respectively in the control (A). Multiple pairwise comparison tests (Post hoc tests) indicated no significant difference at post treatment in compared to pre-ones (P-value =0.368). While NDI mean ± SD values in the "pre" & "post" tests were 30.78±6.95 and 18.26±7.76 in the study (B) respectively. Multiple pairwise comparison tests (Post hoc tests) reported significant reduction at post treatment in compared to pre-ones (P-value =0.0001*).

Table (3): Mean ±SD and p values of NDI pre and post-test at both groups.

<table>
<thead>
<tr>
<th>NDI</th>
<th>Pre test (Mean± SD)</th>
<th>Post test (Mean± SD)</th>
<th>MD</th>
<th>% Of change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>30.12 ±3.88</td>
<td>28.18±3.63</td>
<td>1.94</td>
<td>6.44</td>
<td>0.368</td>
</tr>
<tr>
<td>Group B</td>
<td>30.78±6.95</td>
<td>18.26±7.76</td>
<td>12.52</td>
<td>40.67</td>
<td>0.0001*</td>
</tr>
<tr>
<td>MD</td>
<td>0.66</td>
<td>-9.92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.748</td>
<td>0.0001*</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Significant level is set at alpha level <0.05

MD: Mean difference

3) Absolute Rotatory Angle (ARA):

As tabulated in table (4), within group's comparison ARA mean ± SD values in the "pre" & "post" tests were 16.72 ±3.9and 17.39±4.08, respectively, in control (A). Multiple pairwise comparison tests (Post hoc tests) indicated no significant difference at post treatment in compared to pre-ones (P-value =0.696). While the mean ± SD values in "pre" & "post" tests were 14.50±4.83 and 31.49 ±5.49, respectively in study (B). Multiple pairwise comparison tests (Post hoc tests) reported significant ARA improvement at post treatment in compared to pre-ones (P-value <0.0001*).

Table (4): Mean ±SD and p values of ARA pre and post-test at both groups.

<table>
<thead>
<tr>
<th>ARA</th>
<th>Pre test (Mean± SD)</th>
<th>Post test (Mean± SD)</th>
<th>MD</th>
<th>% Of change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>16.72 ±3.9</td>
<td>17.39±4.08</td>
<td>-0.67</td>
<td>4.00</td>
<td>0.696</td>
</tr>
<tr>
<td>Group B</td>
<td>14.50±4.83</td>
<td>31.49±5.49</td>
<td>-16.9</td>
<td>116</td>
<td>0.0001*</td>
</tr>
<tr>
<td>MD</td>
<td>2.22</td>
<td>-14.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.179</td>
<td>0.0001*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant level is set at alpha level <0.05

MD: Mean difference

IV- DISCUSSION

This study showed that adding McKenzie exercises to conventional therapy for treating Dowager’s hump was more effective than conventional therapy alone. The group treated with McKenzie exercises reported improvement in their pain intensity level, neck functional ability and ARA. Cervical lordosis had increased and became a more normal curve. This research was the first to use McKenzie technique to treat Dowager's hump and used ARA to measure cervical spine curve at females with Dowager’s hump.

Our results were like those of other studies which confirmed that the McKenzie protocol improves cervical ROM, pain intensity and functional neck activity level 9. The improvement in physical performance of patients with dowager’s hump who were treated with McKenzie exercises may be attributed to enhancement of
cognitive and sensory pain perception, in addition to reduced anxiety toward previously felt painful physical activity. Moreover, the results explained that repetitive cervical retraction will modulate pain in cervical radiculopathy as a result of nerve root decompression. Such positive response gained at spinal loading ensured lowered pain intensity, plus centralization of lesion manifestations as well improve cervical mobility.

The results of our study were confirmed by many researchers who recommended that deep cervical flexor exercise (DCF) based on chin in training appeared to be effective clinically in the management of both pain and disability. Retraining these muscles has been demonstrated to alleviate neck problems and increase the ability of the cervical spine to maintain an upright posture, also it was found that chin in exercises is effective in the improvement of ARA and that exercise could have directly modulated pain sensitive structures present across the upper cervical region.

The Neck extension program was implemented in cases with lost cervical lordosis, and it demonstrated significant beneficial results in the cervical lordosis angle and neck pain severity. As a result, lost cervical lordosis should be treated seriously, with treatment approaches aimed not only at symptom reduction, but also at regaining the desired angle of natural cervical lordosis.

Deep cervical flexor exercises that were suggested for treatment of FHP were built on the rationale which addressed that DCF serves an important postural role by both maintaining and correcting cervical lordosis. Thus, high deep cervical flexor endurance was identified throughout any functional sitting tasks and showed improved ability in holding upright posture along the cervical. Chin in exercise for the experimental group allowed them to record improved ARA, but within painful range, as well reported chin in effectiveness for gaining improvement in ARA as well as treating functional disabilities in chronic neck patients.

V- CONCLUSION

Mckenzie technique is very effective as a tool of treatment in Dowager’s hump which affect cervical region also regain normal cervical lordotic curve.

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Ethical Approval: approved by the Ethical Committee of the Faculty of Physical Therapy, Cairo university (P. T .REC/012/001757).

Informed Consent: Participants were provided with a signed informed consent form. All candidates have signed an informed consent statement.

Acknowledgements: All participants should be thanked by the writers.

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