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Mrunalini S
Post Graduate Student, BCF
College of Physiotherapy,
Maravanthuruthu, Kerala

R Rejeesh Kumar
Post Graduate Student, BCF
College of Physiotherapy,
Maravanthuruthu, Kerala

KS Sharad
Post Graduate Student, BCF
College of Physiotherapy,
Maravanthuruthu, Kerala

Corresponding Author:
Mrunalini S
Post Graduate Student, BCF
College of Physiotherapy,
Maravanthuruthu, Kerala

Effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff

Mrunalini S, R Rejeesh Kumar and KS Sharad

Abstract

Background: Mechanical low back pain is defined as a musculoskeletal pain which varies with physical activities and not involving root compression or serious spinal diseases. Usually it is unilateral pain with no referral below the knee may be caused by injury to the muscles or ligaments, the facet joint or in some cases the sacroiliac joint.

Housekeeping staff subjected to repetitive action of cleaning inside Hospital. The cleaning task involves cleaning of toilet, mopping and sweeping of floor, collecting and washing, waste management etc. Cleaning involves pushing and pulling like activities, bending movement. The repetitive work, work below knee level height and carrying heavy loads contribute to musculoskeletal problems. All these repetitive activities with the faulty pattern of postures and the movement will gradually reduce the movement control of lumbar spine, and then further lead to pain and disability in the lumbar spine. Trunk muscles may be unable to control lumbar alignment during movement of hip and thoracic spine. Motor control exercises utilize principle of motor learning theory retrain control of the trunk muscles, postures and movement pattern ultimately leading to reduction in the level of pain and disability.

Objectives: Objective of the study is to find out the effectiveness of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff.

Methods: In this study, quasi experimental design was conducted to test the effectiveness of motor control exercises in the management of mechanical low back pain among housekeeping staff. The study population included 30 participants fulfilling both inclusion and exclusion criteria. Informed consent was obtained from each participant. A description of the study was given to the participants before starting the exercise programme. A 30 sample size was selected by convenient sampling method. The exercise programme was about 6 weeks of duration where exercises are divided into 3 phases. Both pre and post test values of pain and disability assessed by using NPRS and Oswestry Disability Index before and after giving Motor control Exercises.

Result: The study showed significant improvement in mechanical low back pain and disability among housekeeping staff with Motor Control Exercises.

Conclusion: 6 weeks of Motor Control Exercises is effective in reducing mechanical low back pain and disability among housekeeping staff.

Keywords: Motor control exercise, mechanical low back pain

Introduction

Mechanical low back pain is defined as a musculoskeletal pain which varies with physical activities and not involving root compression or serious spinal diseases. Usually it is unilateral pain with no referral below the knee, may be caused by injury to the muscles or ligaments, the facet joint or in some cases the sacroiliac joint ^[1]. Low back pain is the fifth most common reason for physician visits, which affects nearly 60-80 % of people throughout their lifetime ^[2]. Low back pain can be due to number of factors including individual characteristics, working conditions such as heavy physical work, awkward static and dynamic working postures as well as manual handling and lifting, lifestyle factors and psychological factors.

The lifetime prevalence of LBP is reported as 84% ^[3]. The prevalence of LBP has been reported among many people especially when resulting from work-related and occupational activities ^[4]. Mechanical factors have long been thought to have a causal role in low back pain ^[3]. Job related biomechanical factors include heavy physical work, heavy manual lifting, sustained postures and prolonged trunk flexion as well as psychological factors.

Cleaners perform repetitive action of cleaning inside Hospital. The repetitive work of work below knee level height and carrying heavy loads contributes to musculoskeletal problems. The cleaning task involves cleaning of toilet, mopping and sweeping of floor, collecting and washing, waste management etc. Cleaning involves pushing and pulling like activities, bending movement. All these repetitive activities with the faulty pattern of postures and the movement will gradually reduce the movement control of lumbar spine, and then further lead to pain and disability in the lumbar spine. Trunk muscles may be unable to control lumbar alignment during movement of hip and thoracic spine.

Majority of the physiotherapist uses stretching, strengthening exercises, spinal mobilization, soft tissue mobilization, massage and functional activities education [5]. Various exercise therapy approaches like McKenzie exercise along with the electrophysiological agents in the form of heat was used conventionally. Motor control exercises utilize principle of motor learning theory, retrain control of the trunk muscles, postures and movement pattern ultimately leading to reduction in the level of pain and disability [6].

Methodology

Study Design: Quasi experimental study

Sampling Method: convenient sampling

Sampling Size: 30 Housekeeping Staff

Selection Criteria

Inclusion Criteria

- Female
- Age between 25-55 years
- Patient with current low back pain experienced at least over the previous 3 months

Exclusion Criteria

- Disc herniation, lumbar stenosis, spondylolisthesis and spinal fractures
- Polineuropathies, infections, tumors of the spine, systemic bone or joint disorders (e.g. Rheumatoid arthritis)
- Obvious spinal deformity as the primary indication for surgery or post surgical patients
- Anatomically short or limb length discrepancy of >1cm
- Any history of hip, knee ankle surgery within last one year or obvious lower limb injury in the last 6 month
- Inadequate visual and hearing ability
- Pregnancy
- Unstable or severe disabling chronic cardio vascular and pulmonary diseases
- History of serious psychological or psychiatric illness.
- Significant participation in exercises, currently and or in the previous 6 months
- Body mass index > 35 kg/cm²
- Lack of consent of the subject.

Materials Used

1. Arm rest chair
2. Mattresses
3. Stopwatch
4. Pen
5. Paper
6. Pillows
7. Towels

Study Setting

Housekeeping staff of Indo American Hospital, Vaikom.

Study Duration

One Year (22 June 2019 - 23 July 2020)

Outcome Measure

Numerical Pain Rating Scale

The numeric pain rating scale is a measurement of pain intensity in adults. The NPRS is a segmented numeric version of visual analogue scale (VAS) in which respondent select a whole number (0 to 10) that best reflects the intensity of pain. Scores range from 0 to 10.

Oswestry Disability Index

Patient completed questionnaire which gives a subjective percentage score of level of function (disability) in activities of daily living in those rehabilitating from low back pain

Variables

Independent variable is the Motor Control Exercises.

Dependent variables are pain and functional disability.

Procedure

All the housekeeping staff in the Indo American hospital with LBA was conveniently allocated. Prior intervention back pain was assessed using NPRS, Oswestry disability index. After exercises post test values was assessed. Motor Control Exercises was given for 6 weeks program (12 sessions) twice weekly for 30 minutes. The exercises were performed after warm up as three stages. First stage (1-2 weeks) was focused on low load isometric contraction of deep stability muscle through performing an Abdominal Drawing In Maneuver (ADIM) in minimally loading positions (supine lying, quadruped, sitting and standing). The second stage (2-4 weeks) involved additional loads on the spine through various upper and lower limb and trunk movements. In the third stage (4-6 weeks) functional movement patterns was incorporated while performing an ADIM and maintaining a neutral lumbar spine. In each stage the recruitment of trunk muscles, postures, movement pattern, and breathing was assessed and corrected.

Warm Up Stretches

Double knee to chest, erector spinae stretch, hamstring stretch, prone on elbow, trunk rotation stretch, trunk extension stretch with 5 sec hold each

Motor Control Exercise Protocol

Stage/progression	Exercise	Intensity
Stage one (1-2 week)	1. ADIM in supine	7s hold,10 reps
	2. ADIM in quadruped	7s hold,10 reps
	3. ADIM in sitting	7s hold,10 reps
	4. ADIM in standing	7s hold,10 reps
Stage two (2-4 week)	5. ADIM in supine with leg lift(each leg)	7s hold,10 reps

	6. ADIM in supine with bridging 7. ADIM in supine with single leg bridge 8. Supine ADIM with curl ups(elbows on table) 9. Supine ADIM with curl ups(elbows on forehead) 10. ADIM in horizontal side support with knee bent 11. ADIM in horizontal side support with knee straight 12. sidelying horizontal side support with ADIM 13. ADIM in quadruped with arm raise 14. ADIM in quadruped with leg raise 15. ADIM in quadruped with alternate arm and leg raise	7 s hold,10 reps 7s hold,10 reps 7s hold,10 reps 7 s hold,10 reps
Stage three (4-6 week)	16.Rolling from side to side with ADIM 17.Sit to stand transfer with ADIM 18.Wall squatting with ADIM 19.Walking with ADIM 10 minute	7 s hold,10 reps 7 s hold 10 reps 7 s hold,10 reps 7s hold,10 reps



Fig 1: ADIM in supine



Fig 2: ADIM in quadruped



Fig 3: ADIM in sitting



Fig 4: ADIM in standing



Fig 5: ADIM in supine with leg lift



Fig 6: ADIM in supine with bridging



Fig 7: ADIM in supine with single leg bridge



Fig 8: Supine ADIM with curl ups (elbows on table)



Fig 9: Supine ADIM with curl ups (elbows on forehead)



Fig 10: ADIM in horizontal side support with knee bent



Fig 11: ADIM in horizontal side support with knee straight



Fig 12: Side lying horizontal side support with ADIM



Fig 13: ADIM in quadruped with arm raise



Fig 14: ADIM in quadruped with leg raise



Fig 15: ADIM in quadruped with alternate arm and leg raise



Fig 16: Rolling from side to side with ADIM



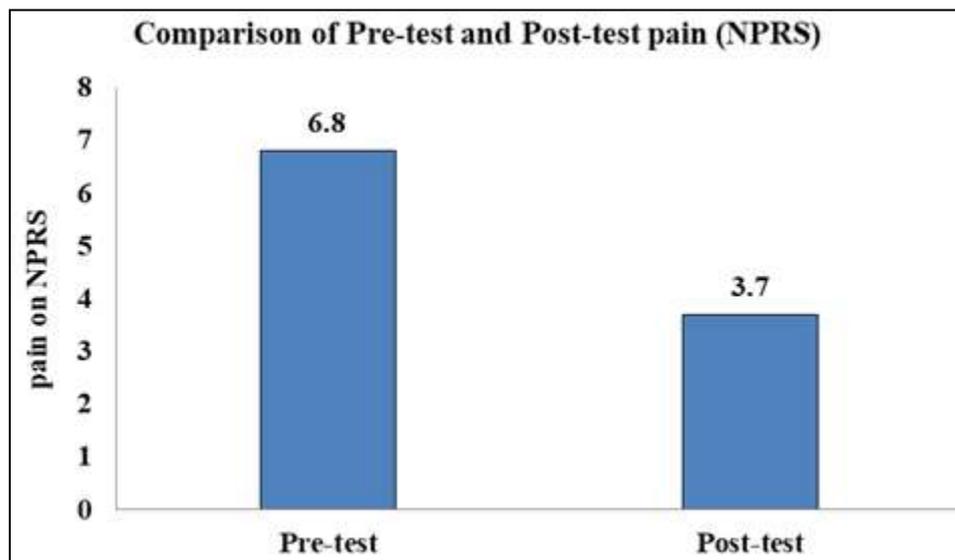
Fig 17: Sit to stand transfer with ADIM



Fig 18: Wall squatting with ADIM



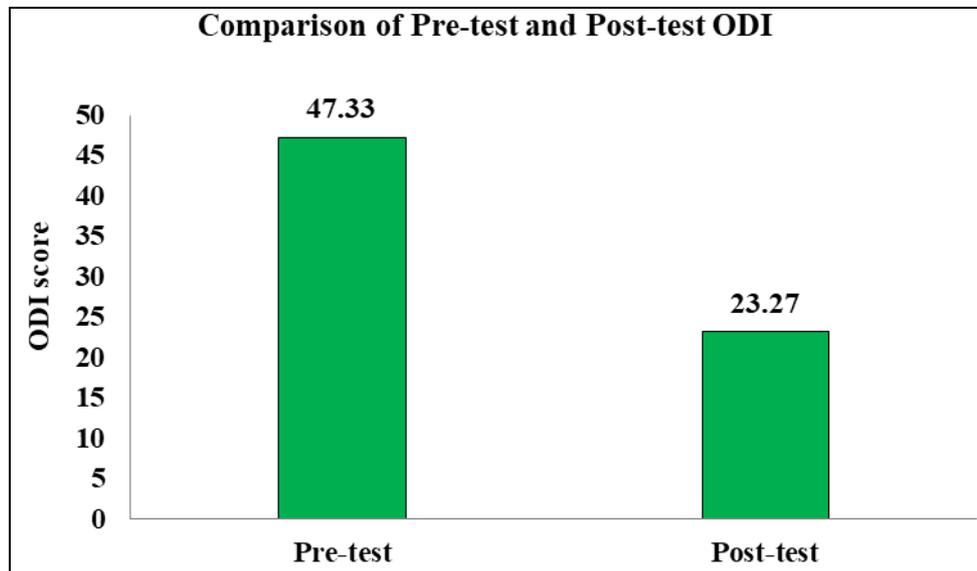
Fig 19: Walking with ADIM



Statistical Analysis: 'T' Test

The mean column displays the mean pre-test and post-test pain scores in NPRS among hospital housekeeping staff. SD is the standard deviations of the pain scores in pre & post respectively. Mean change 3.1 is the difference between pre-test and post-test (6.8 & 3.7). Since the *t-value*, 16.503 is greater than the *table value* 2.045, also $p < 0.001$ indicates

there is a significant difference existing between the pre-test and post-test pain scores among hospital housekeeping staff. The pain has significantly reduced in post-test. This proves the effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff.



The mean column displays the mean pre-test and post-test ODI scores among hospital housekeeping staff. SD is the standard deviations of the ODI scores in pre & post respectively. Mean change 24.06 is the difference between pre-test and post-test (47.33&23.27). Since the *t-value*, 26.83 is greater than the *table value* 2.045, also $p < 0.001$ indicates there is a significant difference existing between the pre-test and post-test ODI scores among hospital housekeeping staff. The ODI score has significantly reduced in post-test. This proves the effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff.

Result

1. Evaluation of Oswestry Disability Index

By comparing the pre-test and post test Oswestry disability index scores in housekeeping staff the mean change 24.06 is the difference between pre test and post test. Since the *t-value* 26.83, $p < 0.001$, there is a significant difference existing between the pre-test and post- test disability index scores among hospital housekeeping staff

2. Evaluation of Numerical Pain Rating Scale

By comparing pre-test post-test NPRS score of housekeeping staff mean change is 3.1 is the difference between pre –test and post test. Since the *t value*, 16.503 is greater than the *table value* 2.045, $p < 0.001$, there is a significant difference exist between the pre-test and post-test pain scores among housekeeping staff. The pain has significantly reduced in the post test.

Discussion

The study aimed to prove the effect of 6 weeks of motor control exercise in reducing mechanical low back pain among housekeeping staff, a quasi experimental study design in Indo American Hospital, Chemmanakari. This study shows significant improvement in pain and functional disability among housekeeping staff. The methods of exercises are inexpensive to reduce mechanical low back pain. Motor control Exercise is a popular form of exercise that aims to restore coordinated and efficient use of the muscles that control and support the spine. Patient is initially guided by a therapist to practice normal use of the muscles during simple tasks. The objective of motor control exercise is to increase activation and voluntary control of deep abdominal muscles. Motor control exercises are intended to alter underlying

neural mechanisms shown to be associated with low back pain. As little as one session with muscle contraction produce can alter cortical excitation and cause improvement in deep abdominal muscle onset of activity. The physiological basis of motor control training is based on the relearning principles of movement patterns and in functional activities facilitating corrected trunk muscle behavior. Wide ranges of mechanism have been postulated to highlight the impact of motor control in pain mechanism. Motor control exercises are designed to improve the function of specific muscles of lumbopelvic region and control of posture and movement using principles of motor learning such as segmentation and simplification. The process include mechanical load reduction, enhanced coordination of muscular and movement control. These changes may be mediated by plastic changes in motor cortex. To some extent the study are in accordance with previous studies which have already reported positive effect of motor control exercises and patient education programme among the Nigerian community. Aminu Ibrahim *et al* 2019 ^[5] showed that patient education programme and motor control exercise programme are effective in treating chronic low back pain among Nigerian community.

SD is the standard deviations of the pain scores in pre & post respectively. Mean change 3.1 is the difference between pre-test and post-test (6.8 &3.7). Since the *t-value*, 16.503 is greater than the *table value* 2.045, also $p < 0.001$ indicates there is a significant difference existing between the pre-test and post-test pain scores among hospital housekeeping staff. The pain has significantly reduced in post-test. This proves the effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff. SD is the standard deviations of the ODI scores in pre & post respectively. Mean change 24.06 is the difference between pre-test and post-test (47.33 & 23.27). Since the *t-value*, 26.83 is greater than the *table value* 2.045, also $p < 0.001$ indicates there is a significant difference existing between the pre-test and post-test ODI scores among hospital housekeeping staff. The ODI score has significantly reduced in post-test. This proves the effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff. This proves that effect of motor control exercise on reducing pain and functional disability among housekeeping staff.

Overall the result of this study suggests that the training on MCE has significant effect on low back pain and functional disability.

Limitation of this study includes a small sample size which may affect the generalization of results, short duration exercise programme, only female subjects were included. Suggestion for future studies include the study should be done in large sample size, long term follow up is needed to be evaluated whether there occurs any sustain or carry over effect after exercise programme.

Recommendation

Suggestion for future studies include the study should be done in large sample size, long term follow up is needed to be evaluated whether there occurs any sustain or carry over effect after exercise programme.

Conclusion

To conclude the housekeeping staff could improve their pain and functional disability after 6 weeks of motor control exercise programme. The observation supported by statistical analysis. Based on the outcomes tools NPRS and ODI, low back pain and functional disability improved.

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