

Effect of Patient Handling Techniques on Work-Related Musculoskeletal Disorders in Ward-Boys and Housekeeping Staff of Hospitals

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Abstract: *Background:* Work-related musculoskeletal disorders (WRMSDs) pose significant challenges to the occupational health and well-being of healthcare support personnel, including ward boys and housekeeping staff in hospitals. These individuals are frequently engaged in physically demanding tasks, such as patient handling, lifting, and repetitive movements, which can lead to various musculoskeletal issues over time. WRMSDs not only impact the quality of life and productivity of these workers but also incur substantial costs to healthcare systems due to increased absenteeism and healthcare utilization. Effective strategies to prevent and manage WRMSDs among hospital support staff are imperative for promoting occupational health and safety. Through a comprehensive assessment of WRMSDs using the Nordic Questionnaire and the evaluation of upper and lower body strength and flexibility, this research aims to shed light on the efficacy of structured exercise routines and patient handling training in reducing the incidence and severity of WRMSDs among healthcare support personnel. However, despite the potential benefits, the specific impact of such interventions on WRMSDs among ward boys and housekeeping staff remains understudied. Therefore, this research seeks to address this gap by investigating the effects of structured exercise regimens and training in patient handling techniques on strength, flexibility, and WRMSDs in these occupational groups. **Aim:** To study the impact of structured exercise regimen and training in patient handling techniques on enhancing strength and flexibility while addressing work related musculoskeletal disorders among housekeeping staff and ward boys. **Objectives:** To assess Work Related Musculoskeletal Disorders (WRMSDs) using Nordic Questionnaire. To assess the effect of upper and lower body strength and flexibility. To evaluate the effect of structured exercise regimen and patient handling techniques on WRMSDs in ward boys and housekeeping staff of hospitals. **Method:** 40 participants were selected based on the inclusion and exclusion criteria. At the beginning of the study WRMSDs was assessed using Nordic Questionnaire. Baseline measurements of upper and lower body strength and flexibility were conducted using outcome measures which included V Sit and Reach Test, Back Scratch Test, Squat Test, Modified Push Up test. Participants underwent a structured exercise program designed to enhance strength and flexibility and training focused on proper patient handling techniques, including lifting, transferring, and positioning. Outcome measures were again assessed post intervention. Statistical analysis was performed to compare pre and post-intervention outcomes. **Result:** This study showed that statistically significant results were observed in all outcome measures with p value <0.001 . Also, there was self-reported reduction in pain related to musculoskeletal disorders. **Conclusion:** This study concluded that there is significant impact of patient handling techniques on the occurrence of work-related musculoskeletal disorders (WRMSDs) among ward boys and housekeeping staff in hospitals. Through the implementation of a structured exercise regimen and training in proper patient handling techniques, there is encouraging outcome in enhancing both strength and flexibility while addressing WRMSDs.

Keywords: Work related musculoskeletal disorders (WRMSDs), patient handling, ward boys, housekeeping staff, strength, flexibility, hospitals

1. Introduction

Hospitals present numerous unique hazards that can impact the health of employees and workers. These risks encompass biological, chemical, ergonomic, hazardous drugs, radiation (both ionizing and non-ionizing), shift work, stress, and violence. To mitigate these hazards, exposure control methods can be employed, including design elimination, substitution, engineering controls, administrative controls, and personal protective equipment, with a particular focus on correcting ergonomic posture.^[1] A 'health care worker' is an individual who provides preventive, curative, promotional or rehabilitative health care services in a systematic way to individuals, families or communities. Hospital housekeeping regularly cleans patient rooms, nursing units, operating rooms, administrative offices, lab sections, waiting areas, and public restrooms. They also replenish medical supplies, empty trash,

collect soiled laundry, and distribute clean sheets and medical gowns. Additionally, some maintain records of replacements and repairs.^[2]

Hospital housekeeping workers often belong to an overlooked category in the labor context, yet they face significant changes in the job environment and a high risk of occupational health hazards.^[3] Despite their lack of formal training, hospital cleaners play a crucial but often overlooked role, facing numerous hazards and health challenges. Therefore, the need to assess this category of workers' exposure to occupational hazards related to their job (i.e., work related disorders) is of utmost importance.^[4]

The musculoskeletal system comprises the soft tissues and bones of the body. Musculoskeletal disorders (MSDs) are defined as any illnesses or injuries impacting one or more

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parts of this system. These can include sprains, strains, inflammation, degeneration, tears, pinched nerves or blood vessels, bone splintering, and stress fractures.^[5] Work-related musculoskeletal disorders (WRMSDs) are associated with occupational risk factors such as work position, posture, physical force, vibration, movement, psychosocial stressors, and individual issues, including cumulative trauma, repetitive trauma, and overuse syndrome. Ergonomic programs aim to prevent, evaluate, and manage WRMSDs.^[6] Among hospital healthcare workers, one prevalent musculoskeletal disorder is low back pain.

Scientific studies indicate a significant correlation between work-related musculoskeletal disorders (WMSDs) and activities involving the transfer of patients. These responsibilities have been identified as a major cause of musculoskeletal disorders (MSDs) among hospital staff, who are engaged in tasks such as transferring patients, changing dressings, and assisting with patient handling before and after surgeries. The nature of hospital work, which involves patient care activities such as transferring, moving, and cleaning in the wards, often leads to musculoskeletal disorders, particularly in the back, shoulders, arms, wrists, and neck. Employees engaged in patient care handling tasks face a higher risk of work-related musculoskeletal disorders (WRMSDs) compared to workers in other industries performing manual handling tasks.^[7] Patient handling and movement tasks are physically demanding, carried out under unfavorable conditions, and often unpredictable. These tasks present various challenges due to differences in patients' size, physical disabilities, cognitive function, level of cooperation, and fluctuating conditions.^[8]

The term "Ergonomics" comes from the Greek words "Ergon," meaning "work," and "nomos," meaning "laws." Essentially, ergonomics translates to "Laws of Work." It encompasses the body of knowledge regarding human abilities, limitations, and characteristics pertinent to design. Ergonomic design involves applying this knowledge to create tools, machines, systems, tasks, jobs, and environments that are safe, comfortable, and effective for human use.^[2] Without incorporating ergonomic considerations into the design of work, workstations, and equipment, the demands of the job can become excessive, leading to work-related injuries.^[9]

WRMSDs have been identified among hospital employees, yet little research has focused on the specific health aspects of Class 4 employees. Healthcare workers (HCWs), particularly ward boys and housekeeping staff, are frequently exposed to ergonomic health hazards during their workday, placing them at a higher risk of developing MSDs such as back pain, neck pain, and knee problems.^[10] Hence, the aim is to study the impact of structured exercise regimen and training in patient handling techniques on enhancing strength and flexibility while addressing work related musculoskeletal disorders among housekeeping staff and ward boys of hospitals.

2. Aim

To study the impact of structured exercise regimen and training in patient handling techniques on enhancing strength and flexibility while addressing work related musculoskeletal

disorders among housekeeping staff and ward boys.

3. Objectives

- 1) To assess Work Related Musculoskeletal Disorders (WRMSDs) using Nordic Questionnaire.
- 2) To assess the effect of upper and lower body strength and flexibility.
- 3) To evaluate the effect of structured exercise regimen and training in patient handling techniques on WRMSDs.

4. Methodology

- Study Design: Interventional study
- Study Type: Quasi-experimental study
- Sampling Method: Convenience sampling
- Study Duration: 1 year
- Duration of Data Collection: 6 months
- Sample Size: 40
- Sampling Calculation: Calculated using G power
- Study Population: Ward-boys and housekeeping staff of hospitals

Inclusion criteria:

- Ward boys and housekeeping staff of both genders.
- Ward boys and housekeeping staff with musculoskeletal disorders in ergo-nomic context using Nordic Questionnaire.

Exclusion criteria:

- History of fracture (<1 year)
- Any recent musculoskeletal surgery

Procedure

- Ethical Approval was taken
- CTRI Registration was done
- Participants were selected based on inclusion and exclusion criteria
- Informed Consent was taken from the participants
- Outcome measures were assessed at the beginning of the study pre assessment
- Structured exercise regimen for 4 weeks and training in patient handling techniques was taught
- Outcome measures were assessed at the end of 4 weeks: post-assessment
- Data analysis done using (SPSS version 29) paired t test

Exercise Protocol:

WARMUP: Each session starts with warm-up.

Table 1: Warmup Protocol

Frequency	Exercises
2 sets of 10 repetitions	i. Spot marching
	ii. Seated knee lifts
	iii. Shoulder rolls
	iv. Alternate hand to foot touch

Functional Strengthening:

Week 1: Each session was preceded by warmup as mentioned in Table 1.

Table 2: Week 1 Functional Strengthening Exercises

Frequency	Exercises
2 sets of 10 repetitions	i. Mini Squats
	ii. Alternating Lateral Lunges
	iii. Bridges
	iv. Partial curl-ups

Week 2: Each session was preceded by warmup as mentioned in Table 1.

Table 3: Week 2 Functional Strengthening Exercises

Frequency	Exercises
3 sets of 10 repetitions	i. Same as week 1
	ii. Prone Lateral Raises
	iii. Wall push-ups

Week 3: Each session was preceded by warmup as mentioned in Table 1.

Table 4: Week 3 Functional Strengthening Exercises

Frequency	Exercises
3 sets of 10 repetitions	i. Same as week 2
	ii. Seated chair dips

Week 4: Each session was preceded by warmup as mentioned in Table 1.

Table 5: Week 4 Functional Strengthening Exercises

Frequency	Exercises
3 sets of 10 repetitions with 5 seconds hold	Same as week 3

Cool-Down: Each session ends with cool-down after functional strengthening.

Table 6: Cool Down

Frequency	Exercises
3 repetitions with 10 secondshold	i. Seated hamstring stretch
	ii. Quadriceps stretch
	iii. Seated cat-cow
	iv. Gentle spine twist
	v. Child-pose
	vi. Triceps stretch

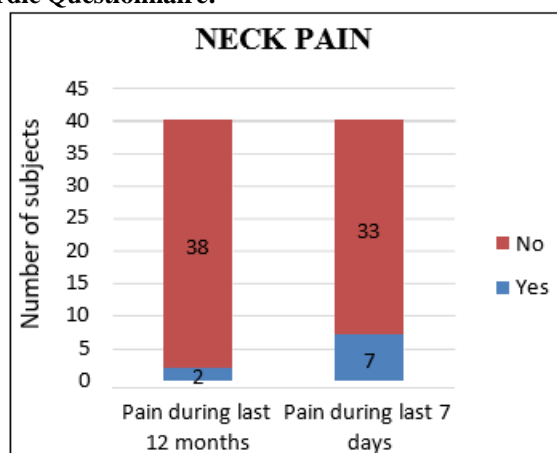
5. Results

All the results were recorded and analyzed by using Statistical Package of Social Science (SPSS) Software version 29. The result was concluded to be statistically significant with $p < 0.05$. Paired t test was used to compare between pre and post interventions.

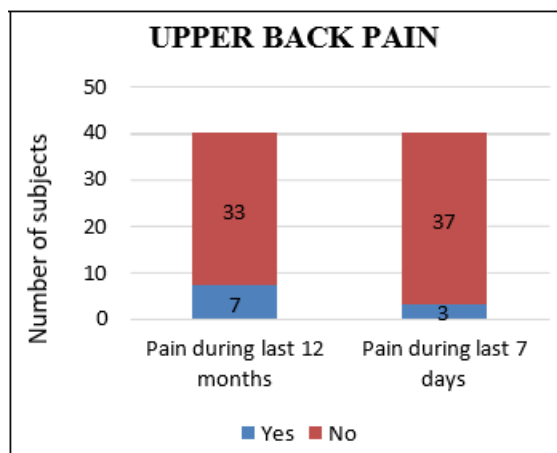
Table 1: Demographic Data

	Males	Females
Age (in years)	41.44 (± 8.64) years	44.25 (± 7.04) years
Number of subjects	36	4

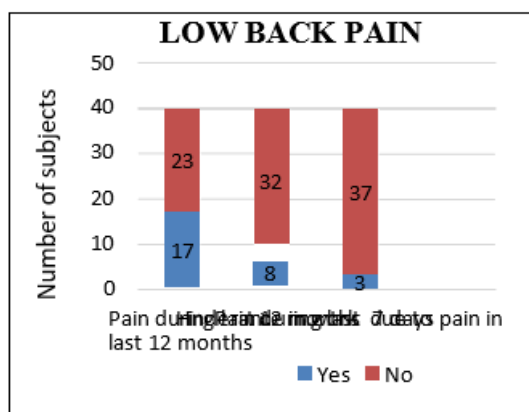
Nordic Questionnaire:



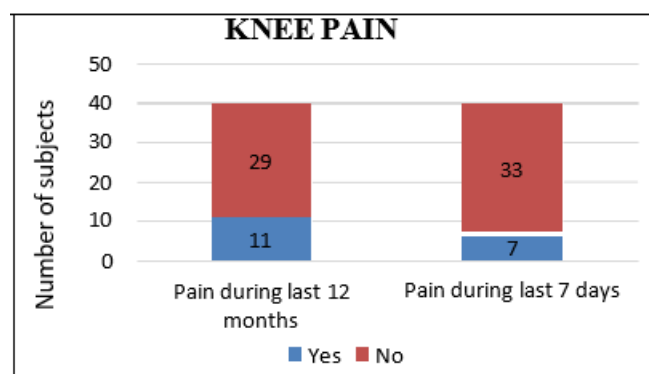
Graph 1: Number of subjects experiencing neck pain



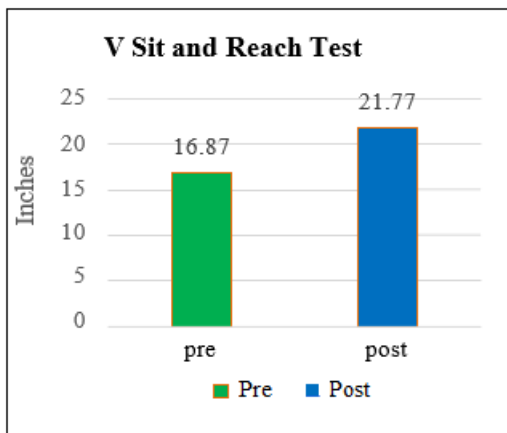
Graph 2: Number of subjects experiencing upper back pain



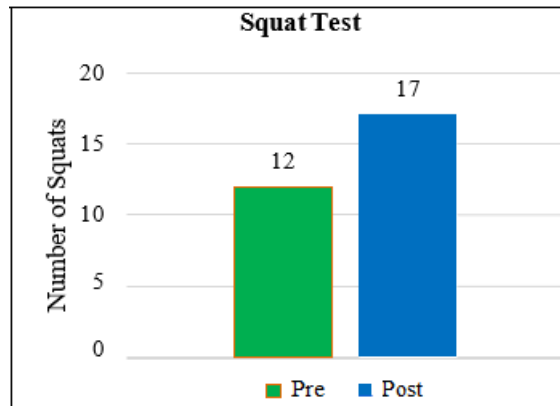
Graph 3: Number of subjects experiencing low back pain



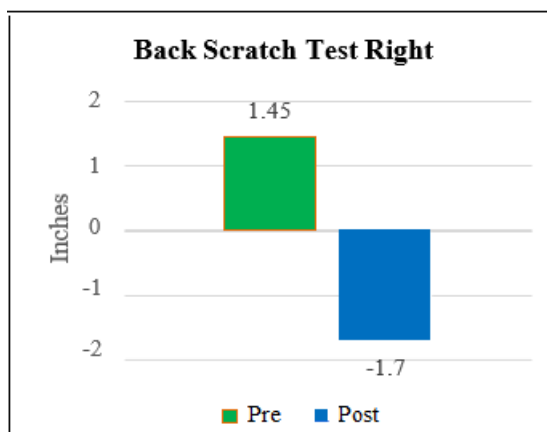
Graph 4: Number of subjects experiencing knee pain



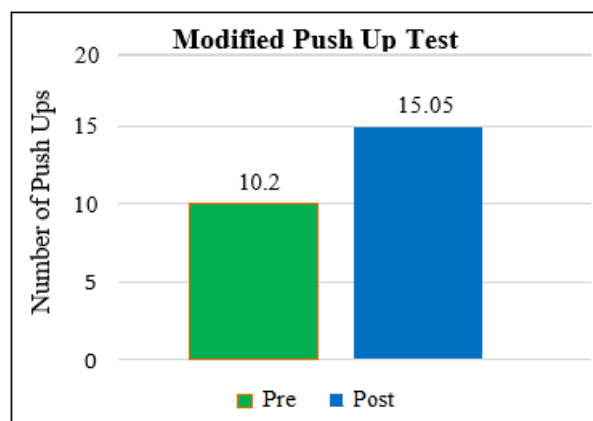
Graph 5: Pre and Post V Sit and Reach Test Analysis of V Sit and Reach Test



Graph 8: Pre and Post Squat Test Analysis of Squat Test

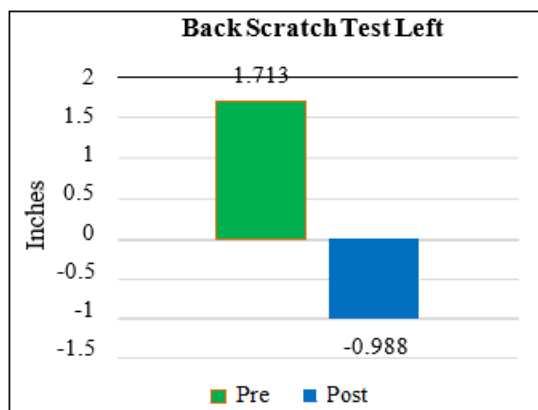


Graph 6: Pre and Post Back Scratch Test Right Analysis of Back Scratch Test Right



Graph 9: Pre and Post Modified Push Up Test

Analysis of Modified Push Up Test



Graph 7: Pre and Post Back Scratch Test Left Analysis of Back Scratch Test Left

6. Discussion

The study aimed to evaluate the impact of a structured exercise program and training in patient handling techniques on enhancing strength and flexibility, as well as addressing work-related musculoskeletal disorders (WRMSDs) in 40 housekeeping staff and ward boys. Over 4 weeks, participants underwent a regimen focusing on strength and flexibility, with three sessions per week. Outcome measures such as the V sit and reach test and Back scratch test for flexibility, and Squat test and Modified push up test for strength were assessed before and after the intervention. Results indicated statistically significant improvements in these measures post-intervention, alongside self-reported reductions in WRMSDs. This highlights the effectiveness of the program in improving musculoskeletal health while enhancing physical capabilities among the participants.

Demographic Data:

As shown in Table 8, total 40 ward boys and housekeeping staff were assessed, out of which 36 were males and 4 were females. The mean age of male participants was 41.44(± 8.64) years and female participants was 44.25(± 7.04) years. Mean years of experience of the participants was 17.9 years.

Nordic Questionnaire:

It was used to assess musculoskeletal disorders in ergonomic context which assessed pain experiencing by the participants in last 12 months, pain experienced by the participants in last 7

days and if there was any hinderance in work due to pain in last 12 months. Participants were selected based on Nordic Questionnaire.

As shown in graph 2, 3, 4 and 5, low back pain was more prevalent in ward boys and housekeeping staff of hospitals when compared to other joints of the body. After low back, knee pain was more prevalent in ward boys and housekeeping staff of hospitals. The participants also reported hinderance in their work due to low back pain.

Flexibility:

This study used V Sit and Reach Test and Back Scratch Test as a measure of flexibility for lower and upper body respectively. A statistical significance was found between pre and post-test with $p < 0.05$ which means that there is an improvement in the flexibility post intervention as shown in graph 6, 7, 8 and table 9, 10, 11.

Stretching increases the range of motion (ROM) by making tissues more pliable and activating inhibitory reflexes. It also enhances stretch tolerance, enabling greater joint flexibility and ease of movement. Regular stretching, therefore, leads to improved muscle length, joint flexibility, and overall movement efficiency.^{[11]-[17]}

The exercise regimen in this study significantly improved upper and lower body flexibility by targeting muscle spindle habituation and neuromuscular adaptations. Stretching exercises gradually increased muscle length and joint flexibility, while engaging inhibitory reflexes and enhancing stretch tolerance. Although range of motion wasn't assessed, this remains a potential area for future research. Overall, the study highlights the effectiveness of structured exercise in enhancing flexibility and reducing muscle injury risk.

Strength and Endurance:

This study used the Squat Test and Modified Push Up Test to measure lower and upper body strength and endurance, respectively, finding significant improvements post-intervention ($p < 0.05$). Adhering to the Overload and Specificity Principles, the regimen targeted both lower and upper body strength. Strengthening exercises led to neuromuscular adaptations, improving motor unit recruitment, synchronization, and firing frequency, and recruited more fast-twitch muscle fibers, resulting in greater muscle strength. Overall, the exercise regimen effectively enhanced strength and endurance, demonstrating its importance for overall physical fitness.^{[18]-[20]}

The intervention included patient handling techniques, supported by evidence showing that proper lifting and handling can reduce musculoskeletal injuries among healthcare workers. Studies indicate that comprehensive plans, including training and proper equipment, significantly lower MSD incidence. For instance, safe patient handling legislation in California led to fewer injury claims among hospital workers. Our study included training in patient handling, likely contributing to improvements in strength, flexibility, and a reduction in work-related musculoskeletal disorders (WRMSDs) among housekeeping staff and ward boys. Participants also reported decreased MSDs, particularly low back pain.^{[21]-[24]}

The study's findings are strengthened by rigorous statistical analysis, including paired t-tests, which showed significant improvements pre- and post-intervention. These results provide robust evidence of the intervention's effectiveness, validating the efficacy of structured exercise regimens and patient handling techniques in enhancing musculoskeletal health among healthcare workers.

7. Conclusion

The study concluded that there was statistically significant improvement in all the out-come measures post intervention. The structured exercise regimen and training in patient handling techniques had significant effect on V sit and reach test, Back scratch test, Squat test and Modified pushup test with $p < 0.001$. Also, there was self-reported reduction in pain related to musculoskeletal disorders. Hence, we conclude that structured exerciseregimen and training in patient handling techniques are effective in reducing work-related musculoskeletal disorders in ward boys and housekeeping staff of hospitals.

8. Limitations and Future scope of study

8.1 Limitations

- Long term and follow-up results are needed to assess the effectiveness and lasting action of structured exercise program and patient handling training.
- Lack of control group may be challenging to determine the specific contribution of the structured exercise regimen.
- This research could benefit from broader recruitment across multiple healthcare facilities to improve the generalizability of the findings and enhance their relevance to diverse populations.

8.2 Future scope of study

- Comparative studies comparing different types of exercise interventions, patient handling techniques, or ergonomic interventions could provide valuable insights into the most effective strategies for preventing and managing WRMSDs.
- Future study could involve objective assessment of range of motion to offer valuable insights into the specific improvements in flexibility achieved through the exercise protocol, providing a more comprehensive understanding of its impact on musculoskeletal health.

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