Effect of Ergonomic Advice on Upper Extremity Work Related Musculoskeletal Disorders in House-Keepers

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ABSTRACT

Introduction: Work related musculoskeletal disorders of upper limb are one of the most common occupational disorders around the world. The pattern of occurrence of WRMSDs and its relation with ergonomic intervention among housekeepers has not been widely reported. The aim of study was to compare effect of ergonomics along with exercise verses only exercise in UEWRMSDs in housekeepers.

Methods: A randomized control trial conducted among housekeepers. Subjects fulfilling inclusion criteria were taken. Numerical Pain Rating Scale and Nordic Musculoskeletal Questionnaires used as outcome measure. 100 subjects screened and 30 were included in study. Subjects were randomly allocated into two groups. Group A received conservative exercise with ergonomic intervention for their housekeeping activities like sweeping, mopping, wringing mops, cleaning walls. Group B received conservative exercise. Treatment protocol continued for 2 weeks.

Result and Discussion: All the participants completed the study and used for data analysis. There was significant (p< 0.05) decrease in pain in neck at activity in Group A compared to Group B. Thus, Group A showed more significant effect of ergonomic improvement than Group B. Hence, ergonomic intervention showed beneficial effect to reduce musculoskeletal disorders in housekeepers.

Conclusion: From this study it can be concluded that exercise with ergonomic intervention are effective in relieving upper extremity work related musculoskeletal disorders.

Key words: upper extremity work related musculoskeletal disorders, ergonomic intervention. Numerical pain rating scale, Nordic Musculoskeletal Questionnaires.

1. INTRODUCTION

“Occupational injury” is generally defined as an injury arising out of or in the course of employment resulting from the action of a physically or chemically traumatizing agent. Work related musculoskeletal disorders or occupationally related cumulative trauma disorders are syndromes characterized by discomfort, impairment, disability or persistent pains in joints, muscles, tendons or other soft tissues with or without
physical manifestation.\textsuperscript{[1]} Other predisposing factors to WMSDs include genetic predispositions, mental stress, physical conditioning, age and obesity, etc.\textsuperscript{[2]} It is like that design of work place equipment or the environment or both and training workers in ergonomic principles may reduce the risk of workers developing these work related musculoskeletal disorders. At work, static muscle loading may occur because of prolonged awkward postures or the need of stabilize or manipulate tools or control. \textsuperscript{[3]} High risk sectors include nursing facilities, air transportation, food processing, leather tanning and heavy and light manufacturing (vehicles, furniture, electronics products).\textsuperscript{[5]}

Upper extremity musculoskeletal disorders are also highly prevalent in manual-intensive occupations, such as clerical work, postal service, cleaning, industrial inspection and packaging.\textsuperscript{[6]} Many studies shows that there is high occurrence of neck pain in workers. Housekeeper’s job activity involves repetitive movements of cleaning, mopping, sweeping which may lead to occupational related injuries in upper extremity.

According to the review of epidemiological studies from 1966 to June 2004 the point prevalence of upper extremity musculoskeletal disorders in workers ranged from 30% to 47%.\textsuperscript{[7]} The annual prevalence of neck pain in working populations ranged from 19% to 48%.\textsuperscript{[8]} Recent studies shows that 81.48% sweepers shows pain while working. Prevalence of difficulty in activity of daily living in sweepers 54.54% and joint affected of upper extremity ranged is 81.8%. In sweepers, 22.72% people affected with neck pain and 31.81% people affected with shoulder pain.\textsuperscript{[9]} Overuse injuries, Rotator cuff tendonitis, Traumatic injuries, Degenerative problems may develop in shoulders from many years of task specific work.\textsuperscript{[10]}

Occupational risk factors includes Heavy physical work Sustained trunk posture (stooping, reaching ), Prolonged sitting, Frequent bending and twisting of trunk, Lifting, lowering , pushing and pulling activities, Exposure to whole body vibration.\textsuperscript{[11]}

Ergonomic proves effective to reduce occupational disorders. Physical ergonomic factors like equipment design, improvement in posture, reduction in forces, proper lifting technique, work place modification may achieve as much as benefits to improve in health. Ergonomics can be considered a design philosophy that focuses on supplying a product that ensures safety, ease of use, comfort and efficiency. Thus continued application of a combination of regular exercise, relaxation training, ergonomic intervention, work organization and work modification, team work, work- rest cycle and effective communication between the worker and supervisors helps in reducing musculoskeletal disorders among the housekeepers.\textsuperscript{[12]}

Ergonomic design and training intervention have been heavily promoted for the prevention of work related upper limb disorders. Victor CW Hoe et al shows that ergonomic factors correlate with musculoskeletal symptoms. Ergonomic training is also focused on modifying risk factors through education and empowerment of workers.\textsuperscript{[3]}

Ergonomic focuses on the point where both the technological side of production and human side connects. The combination of the two interests ergonomists- the interrelationships of humans and their tools.\textsuperscript{[13]} It focuses on the study of work performance with emphasis on worker safety and productivity. Ergonomics focuses on humans and their interactions with the environment.\textsuperscript{[14]}

Hence this study was carried out to check prevalence of upper extremity work related musculoskeletal disorders in housekeepers; To assess the effect of work place ergonomics training along with exercise intervention for upper extremity musculoskeletal disorders in housekeepers.
2. MATERIALS AND METHODS
This study was conducted on 100 housekeepers working in Pimpri Chinchwad area. Study setting was Dr.D.Y.Patil College of Physiotherapy. Approval to carry out this study was obtained from the research and ethical committee of D.Y.Patil Vidhyapeeth.
Written informed consent was obtained from participants was given to them explanation of study. Inclusion criteria was Patient with upper extremity musculoskeletal disorders, Age group 25-50 years, Experience of housekeeping should be minimum of 12 months, Minimum 8 hours working per day and exclusion criteria is Patient with neurological deficit, or any congenital defect, Traumatic injury to upper limb.

Procedure: First, screening was done on 100 female housekeepers of D.Y. Patil Vidhyapeeth and prevalence of MSD was assessed. Samples were selected who are employed to perform household activities like sweeping, mopping, dusting. 30 subjects of having neck pain and shoulder pain were selected. They were divided into two groups named group-A and group-B consisting 15 subjects each by random allocation method.
Conservative treatment given for the participants of group A and B. For neck pain, isometric exercise, stretching of upper, middle trapezius and pectorals was given. And Myofascial release for upper trapezius was also given. Home exercise was also taught to all participants, which includes retractor strengthening, neck Isometric exercise and self-stretching with five repetition of each exercise. Participants also advised for hot water fermentation for 10 minutes using hot water bag at home. For shoulder pain, Maitland mobilization, scapular setting exercise, shoulder isometric was given. Along with the conservative treatment ergonomic intervention was also given for 2 weeks. Ergonomic advice given to Group A. Ergonomics advice was decided according to their posture and work related problems. Advice were given in their normal routine activities like: Sweeping, Mopping, High dusting, Lifting garbage, Wringing mops, Cleaning tile walls.\(^{[17]}\)
Dependent variables included Numerical Pain Rating Scale (NPRS), Nordic Musculoskeletal Questionnaire (NMQ). Data was obtained for each subject on 1st day before treatment and after 2 weeks of protocol. Data was collected for each subject by calculating the average value of the variables of all the 30 subjects and then the statistics were conducted. Analysis done with the use of primer software. Parametric testing was used to compare groups since the quantitative dependant variables were reasonably normally distributed. Paired t-tests were used to compare quantitative outcomes within group. Independent t-tests were used to compare quantitative outcomes between the two independent groups. Confidence Interval was kept at 95%. Since the p value> 0.005 in this study, the groups were comparable.

3. RESULTS
A total 100 Housekeepers were screened, 30 were participated in study. Table 1 shows the demographic characteristics of participants. The two groups did not differ significantly in terms of their age, working hours and years of experience.

3.1: Demographic data of subjects studied in both groups

<table>
<thead>
<tr>
<th>Demographic Data</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30.33</td>
<td>32.33</td>
</tr>
<tr>
<td>Years of Experience</td>
<td>2.7</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Table 3.2 shows mean scores and P value of NPRS and Nordic Questionnaire of Group A and B. It shows that less significant difference found between two groups in numerical pain rating scale at rest in neck pain and shoulder pain. In Group A, mean of pain decreased significantly from 5.93 to 2.06 on NPRS. In comparison of Group A and Group B, the t value is 2.27 and p value is 0.03, which shows significant results for Group A compare to Group B in numerical pain rating scale at activity in neck pain. In comparison of both groups the t value is 2.67 and p value is 0.02, which shows results for Group A is significant compare to Group B in Nordic Musculoskeletal Questionnaire in Neck. p value is 0.02, which shows results for Group A is significant compare to Group B in Nordic Musculoskeletal Questionnaire in Shoulder.

### 3.2: Mean scores and P values of NPRS and Nordic Questionnaire of Group A and Group B

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Group A</th>
<th>Group B</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>NPRS of Neck At Rest</td>
<td>3.33</td>
<td>0.73</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td></td>
<td>5.93</td>
<td>2.06</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>NPRS of Shoulder At Rest</td>
<td>3</td>
<td>0.3</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td></td>
<td>5.6</td>
<td>2.2</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Nordic Questionnaire Neck</td>
<td>7</td>
<td>2.6</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td></td>
<td>8.3</td>
<td>3.4</td>
<td>&lt;0.001**</td>
</tr>
</tbody>
</table>

** highly significant/ *significant
4. DISCUSSION

This study was carried out to compare the effect of exercise with ergonomic intervention and only exercise in housekeepers. Housekeeping activities include sweeping, mopping, cleaning tile walls, lifting garbage, high dusting, wringing mops which involves repetitive movements of neck and shoulder and which lead to muscle strain and pain in neck and shoulder. Significant differences were found over the course of 2 week training programme. The high prevalence of work related musculoskeletal disorders in housekeepers may be related to a repetitive work, manual handling, altered posture. Main areas involved in upper extremity were neck and shoulder and no participants reported in the study having elbow or wrist pain.

This study showed improvement in pre post treatment values of NPRS at rest in both Groups. While comparison of both group there was no significant difference found between two groups in neck and shoulder. It is because ergonomic intervention mainly work in activity rather than rest. Ergonomic advices given for the working posture and activity, so there was less effectiveness of ergonomic in comparison. In shoulder, At activity there was clinically more differences found, but statically non-significant difference, which may be because of modification in work programme was given by utilizing available resources only.

Neck pain may occur because of repetitive movement of neck, overhead work, overuse of muscle, which lead to muscle spasm and muscle sprain. Anatomy is altered due to overuse of muscle. There is other mechanism which involves during lifting and repetitive work. The nature of stresses taken by worker during lifting are multiple, like vertical compression, horizontal shear, rotatory torque and variety of combination of these factors. During these kind of activities elements of human body i.e., the vertebrae, the spinal ligaments, muscles, different joints will take part and endure the stress differently in different phases of work. The magnitude of forces depends upon given amount of weight being lifted. \[^2\]

As this study demonstrated that there was significant improvement in neck pain at activity. After comparison Group A showed more significant effect of ergonomic improvement than Group B. Josephine A. E. et al showed the effects of an office ergonomics in workplace and training intervention to reducing work related musculoskeletal disorder.\[^{15}\] Ergonomic proves effective to reduce occupational disorders. Physical ergonomic factors like equipment design, improvement in posture, reduction in forces, proper lifting technique, work place modification may achieve as much as benefits to improve in health.\[^{12}\] In both groups, participants received Stretching, isometric neck and shoulder exercise, mobilization. Following this intervention the severity and pain decreased. The improvement in symptoms is due to improvement in elasticity of muscle and by achieving comfortable muscle tone after stretching.\[^{16}\]

Overall, it appears that due to ergonomic advices, workers were able to appropriately change and adjust their working posture as well as use the workplace facility more ergonomically and effectively. These study suggest that the provision of ergonomic, in form of training helps in reducing musculoskeletal discomfort associated with housekeeping activity.

Limitations of this study were Household activities performed by participants at home, mode of transport was not considered. There were no instrumental modification given in work design of housekeepers. Future study can be done with long term follow up, like after 2 weeks participants following the ergonomic advice or there is reoccurrence of previous symptoms. Ergonomic advices can be given with use of work design modification.
5. CONCLUSION
It can be concluded that exercise and ergonomic intervention are effective in relieving upper extremity work related musculoskeletal disorders. However, on comparison ergonomic intervention showed more better results to alleviate the pain.

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