

Effect of Chronic Shoulder Pain on Scapular Muscle Endurance in Construction Workers - A Cross Sectional Study

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ABSTRACT

Background: Construction workers have excessive and repetitive overhead arm movements which places high demands on shoulder muscle strength and endurance. It is important to have good scapular muscle endurance in construction workers to prevent work related musculoskeletal disorders. Studies have shown that pain has negative impact on muscle strength i.e., muscle strength reduces in chronic pain. However, the effect of pain on muscle endurance is not been studied so this study explores the effect of chronic shoulder pain on the scapular muscle endurance.

Aim: To study the effect on scapular muscle endurance in construction workers with chronic shoulder pain.

Methodology: 50 construction workers were included where 25 subjects with chronic shoulder pain (group 1) and 25 without shoulder pain (group 2) were recruited fulfilling the inclusion criteria. Written consent was obtained from each subject. Each participant was interviewed Nordic musculoskeletal questionnaire for non-specific chronic shoulder pain and pain intensity was recorded using Visual analog scale. Both the group subjects were tested for scapular muscle endurance using scapular endurance test; two trails of the test were performed.

Results: The scapular muscle endurance was significantly lower in Group 1 with chronic shoulder pain than in Group 2 without pain ($p < 0.05$).

Conclusion: Our study assessed the effect of scapular muscle endurance in construction workers with chronic shoulder pain, and our results suggest that the scapular muscle endurance was significantly lower in group having shoulder pain.

Keywords: Construction Workers, Work Related Musculoskeletal Disorder, Chronic Shoulder Pain, Scapular Muscle Endurance

INTRODUCTION

Construction is one of the world's largest industrial sectors and contributes to substantial numbers of occupational related accidents and ill health globally.^[1] The daily activities in construction industry include frequent lifting and carrying of heavy loads, static work, and exposure to vibrations and extreme weather conditions, which are the factors related to work-related diseases and injury.^[2] Their job also involves in erecting structures and demolition, distributing

materials, loading and unloading of construction materials, drilling, mixing concrete, handling trowels and shovels and also cleaning of spills or hazardous materials.

Construction laborers job demands to work overhead, reaching up with one or both arms raised above shoulders, head may be tilted back, looking up to see what you are doing, drilling work, driving fasteners, or overhead work that puts stress on shoulders and neck.^[3] All activities require

vigorous usage of shoulder joint due to repetitive nature of work and overhead activity. Shoulder pain is very commonly noted as a result of extrinsic risk factors such as repetitive overhead use of shoulder (>60° of shoulder elevation), sustained overhead work, higher loads raised above shoulder height and incorrect posture which directly imposes high demands on shoulder muscle strength and endurance. [4]

A study determined that the rate of work-related musculoskeletal disorders (WMSDs) was high about 45% affecting 18.9% in shoulders in construction workers. [5]. Studies have shown that pain has negative impact on muscle strength in chronic shoulder conditions. However, the effect of pain on muscle endurance hasn't been studied. Therefore, this study aims to study the effect on scapular muscle endurance in construction workers with chronic shoulder pain.

MATERIALS & METHODS

The present study was cross sectional study. A convenient sampling method was used to select participants from the 4 construction sites in Mumbai after taking permission from the respective work sites. 50 construction workers were included where 25 subjects presented with chronic shoulder pain (group 1) and 25 without shoulder pain (group 2) were recruited.

Participants having more than 5 years of work experience between age group of 30-45 years and willing to participate were included. Participants with recent surgeries of upper limb, fracture around arm wrist and forearm, any neurological abnormalities, pregnant females, any congenital anomalies were excluded from the study.

Aim and procedure of the study were explained to all participants in the language understood before data collection. Informed consent form was taken from all the participants.

Participants:

Demographic details including name, age, gender and the work-related

history- hours/work experience was documented.

Participants were explained in detail the purpose and procedure of following assessment.

1. Nordic Musculoskeletal Questionnaire:

- The Nordic Musculoskeletal Questionnaire is used to identify those with non-specific chronic shoulder pain. [6] 9 questions under shoulder domain were interviewed to the subjects

2. Pain intensity:

- Shoulder pain intensity while at rest and during activity was measured using a 10-cm visual analog scale (VAS). A score of "0" indicates no pain, and a score of "10" indicates the most severe pain possible. [7]

3. Scapular endurance test:

- The subject was asked to position in prone lying, the subject's shoulder was passively positioned to 135° of shoulder abduction. A cuff weight (rounded to 0.5lbs of 1% of the patient's body weight) was strapped just superior to the elbow.
- Arm was positioned at a height parallel to the trunk and at 135° of shoulder horizontal abduction. The participant was then asked to raise and hold their arm to the established level for as long possible.
- The test was terminated when the subject voluntarily lowered their upper extremity or if the subject's distal radius was no longer contacting the level. [10]
- Only the dominant hand was assessed. The participant was asked to perform the test twice and the best of two was recorded in seconds.

Statistical analysis

The values were documented in Microsoft office excel sheet version 2007. The descriptive analysis was done for demographic characteristics and for the pain

outcomes. P value in between both the group and co-relation between scapular muscle endurance with demographic characteristics were analyzed using GraphPad Instat 3.1.

RESULT

Following tables demonstrate the baseline characteristic of the study population.

There were 19 Male and 6 Female with chronic Shoulder pain in Group 1 ($n = 25$), and 16 male and 9 female without pain in group 2 ($n = 25$). 21 participants (84%) in group 1 showed right-hand dominance, and 20 participants (80%) showed right-hand dominance in group 2. (Table 1).

The working hours was noted 56% in group 1 and 68% in group 2 worked for 8 hours where work experience was between 11-15 years for majority of the subjects in both groups. The body mass index in group 1 showed majority of population was normal (44%) and overweight (44%). While in group 2 majority of population was overweight (60%).

The pain on VAS was noted about 40% of population having pain 1/10 on activity and on rest where as 24% of subjects reported 2/10 and 3/10 of pain on activity. Rest 12% of participants reported >4/10 pain.

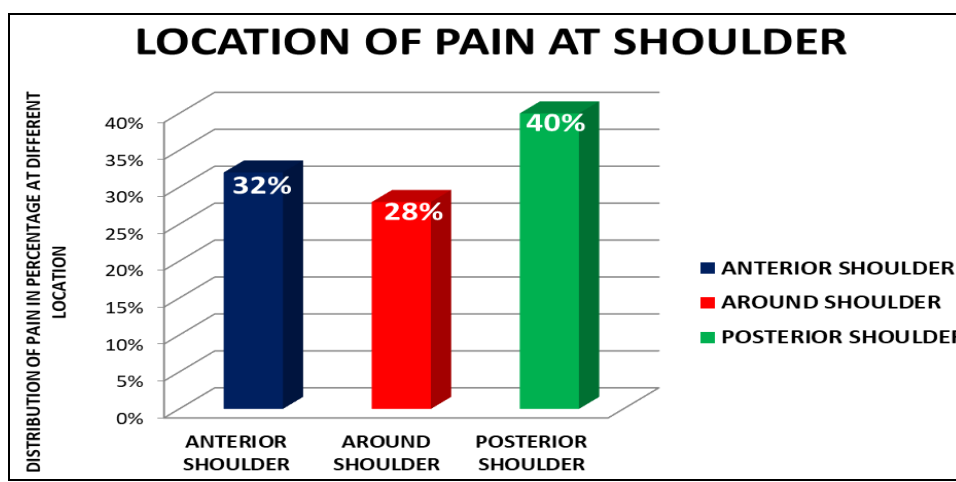


Figure 1: LOCATION OF PAIN AT SHOULDER

Inference: Majority of population about 40% experience pain in posterior part of shoulder joint.

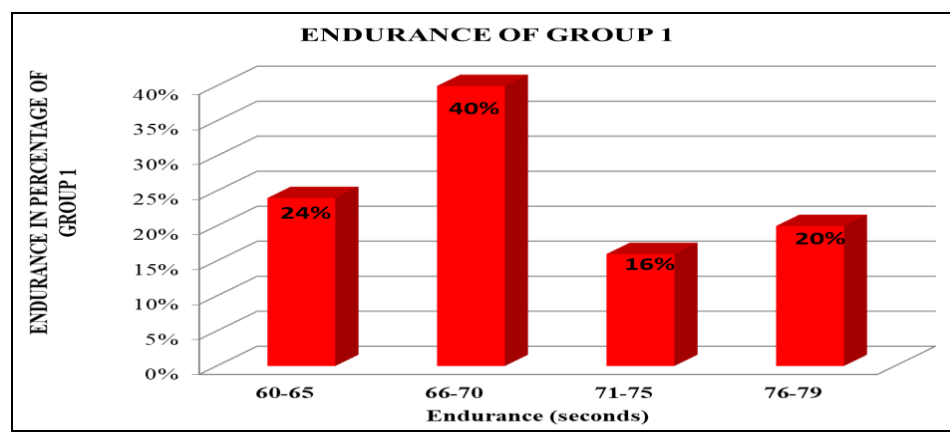


Figure 2: SCAPULAR ENDURANCE IN SUBJECTS WITH CHRONIC SHOULDER PAIN

Inference: About 40% of the population has endurance between 66-70 secs.

The scapular endurance noted in group with chronic shoulder pain was

between 66-70 sec (40%), 24% of subjects had between 60-65 sec.

In group without pain 48% subjects had scapular endurance between 86-90 seconds and 28% between 91-95 seconds. (Figure 2 & 3) On comparison in both groups, group with chronic shoulder pain showed significant lower scapular endurance ($p < 0.0001$).

Pearson co-relation test was used to correlate the demographic details with the scapular muscle endurance in group with chronic shoulder pain. There was no significant correlation observed between the variables.

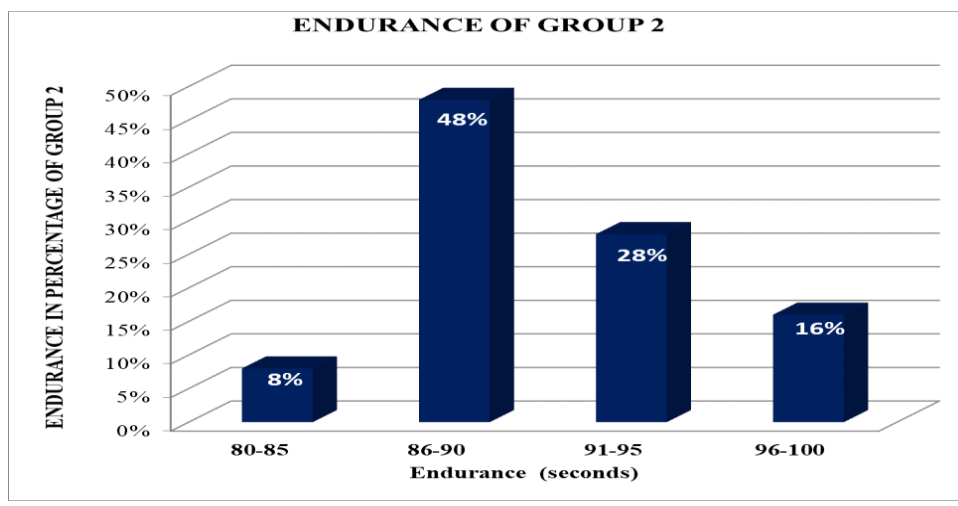


Figure 3: SCAPULAR ENDURANCE IN SUBJECTS WITHOUT SHOULDER PAIN

Inference: About 48% of the population has endurance between 86-90 secs.

Table 1: Comparison of the group's demographic characteristics, working time and working duration.

	GROUP 1 (n=25)	GROUP 2 (n=25)	P
Gender - n (%)	Male-19 (76) Female- 6 (24)	Male- 16 (64) Female- 9 (36)	
Hand Dominance - n (%)	Right- 21 (84) Left- 4 (16)	Right- 20 (80) Left- 5 (20)	
Age (years)	37.04 ± 4.46	36.24 ± 4.53	0.5609
BMI (kg/m sq.)	24.59 ± 3.77	23.83 ± 3.29	0.4554
Working Duration (years)	11 ± 2.67	10.56 ± 2.39	0.5434
Weekly Working (hours)	9.04 ± 1.30	8.72 ± 1.13	0.3602

Inference: The groups were homogeneous in terms of demographic characteristics. When the two groups were compared in terms of weekly working time and employment duration, no statistically significant difference was observed ($p > 0.05$)

Table 2- Comparison of the group's scapular endurance test

	GROUP 1 (n=25)	GROUP 2 (n=25)	P
Scapular Endurance Test(sec)	69.59 ± 5.57	90.00 ± 4.29	< 0.0001

Inference: The scapular muscle endurance was significantly lower in Group 1 with chronic shoulder pain than in Group 2 without pain ($p < 0.05$).

Table 3- The correlation between scapular muscle endurance and age, BMI, Working time and duration, pain intensity

Pearson correlation $n = 25$	Scapular muscle endurance	
	R	P
Age	-0.07972	0.7048
BMI	0.3533	0.0832
Weekly working time	0.1575	0.4521
Working duration	0.04145	0.8440
Pain on rest	-0.1585	0.4492
Pain on activity	-0.08650	0.6810

Inference: In Group 1, the mean pain intensity score was 0.4 ± 0.7 at rest and 2.12 ± 2.82 during activity, but no significant correlation was observed between SME and rest/activity pain intensity, age, BMI, weekly working time, or duration ($p > 0.05$, Table 3).

DISCUSSION

Chronic shoulder pain is one of the most common health problems experienced among construction workers. The aim of our study was to evaluate the effect on scapular muscle endurance in construction workers with chronic shoulder pain which was found to be significantly lower as compared with other groups without any shoulder pain. A study conducted by M.F. Antwi-Afari et al. in Hong Kong evaluated the effects of lifting weights during a simulated repetitive lifting task and concluded that risk factors such as lifting weights, repetitions and lifting postures may alleviate the risk of developing WMSDs in construction workers.^[11] Similar to our study where shoulder pain is very common and is the result of extrinsic risk factors such as repetitive overhead use, sustained overhead work, and higher loads raised above shoulder height and incorrect posture.

In our study, the effect of weekly working hours and employment duration were also analysed, but no statistically significant difference was found between groups with and without chronic shoulder pain. This may also suggest that harmful effects or cumulative shoulder pain may occur over time in the work duration. While in study conducted by Shahnawaz Anwer et al. in Saudi Arabia to learn more about the musculoskeletal pain among construction workers where it was seen that years of experience, duration of breaks while working, and use of protective equipment were related to musculoskeletal pain.^[12]

Furthermore, our results indicated that BMI was not related to the development of chronic shoulder pain. BMI of both the groups was between 25.0-29.9 that suggested under overweight. There was no correlation found between high BMI and pain in the subjects with chronic shoulder pain. In contrast to that a study conducted in 2008 by Heim et al. reported a positive association between BMI and pain at all studied body parts in adults, indicating that obese adults have an increased risk of developing pain.^[13]

Similar inconsistency is observed when comparing the relationship between shoulder muscle endurance and neck or shoulder pain. The findings of Van Reenen et al. on 1789 workers were similar when comparing shoulder static muscle endurance with isokinetic lifting strength and shoulder pain.^[14] In this study, it was found that workers with low isokinetic lifting strength were at greater risk of shoulder pain; however, there was no relationship between static shoulder endurance and shoulder pain. Notably, static endurance of the shoulder elevators was estimated, but scapular muscle endurance was not assessed.

Changes were seen in our study where there was no significant correlation between pain and endurance. Researchers often have inconsistent results when examining the relationship between muscle endurance or strength and musculoskeletal pain. The results of our study showed that chronic shoulder pain affected scapular muscle endurance alone and there was no involvement of other risk factors such as right-hand dominance versus left-hand dominance, gender, and time spent working. Thus, our results demonstrated that scapular muscle endurance is affected in construction workers with chronic shoulder pain.

CONCLUSION

Our study assessed the effect of scapular muscle endurance on chronic shoulder pain in construction workers, and our results suggest that the scapular muscle endurance was significantly lower in group having shoulder pain than in group without shoulder pain ($p < 0.05$). However, present study included participants with chronic shoulder pain with a limited sample. Therefore, only a limited interpretation of present results is possible. Further studies must be performed with large sample.

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Conflict of Interest: None

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Ethical Approval: Approved

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