CHAPTER 100

Musculoskeletal Disorders of Construction Workers

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ABSTRACT

This study explores the causes, effects, and remedies of musculoskeletal disorders (MSD) among construction workers. MSD represents a major challenge and source of agony with impaired mobility and economic burden on the healthcare of construction workers. It also affects productivity as it leads to absenteeism. There are risks associated with construction workers involving repetitive motion, awkward postures, heavy lifting, vibrations, and improper ergonomic practices. A study was conducted on construction workers to find MSDs faced by construction workers. The sample size of this study was 153. The study was conducted using convenience sampling. The result of the study is likely to be analyzed statistically. Finally, significant measures and recommendations will be discussed for such work-related MSDs.

Keywords: Musculoskeletal disorder; MSD; Health; Construction worker; Risk.

1.0 Introduction

1.1 Background of study

Even for the skilled workforce, repetitive construction work can be tedious given that it comprises manual and physical tasks, and often their execution is done under harsh conditions. Engaging in activities like lifting heavy materials into place, holding uncomfortable positions, and undertaking cyclic movements are the greater contributors to musculoskeletal disorders (MSDs) (Guo, 2004). This leads to chronic pain reduced mobility, and increased absenteeism affecting both the individual and the overall industry productivity.

1.2 Problem statement

Even with the implementation of various occupational safety measures, construction workers are still at a higher risk of developing MSDs ((OSHA), 2000). The absence of ergonomic aids and poor safety standards in the workplace help to make sure these conditions do persist. This study attempts to analyse the reasons and consequences of MSDs and try to propose effective strategies to control them.

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DOI: 10.17492/JPI/NICMAR/2507100 *ISBN: 978-93-49790-54-4*

1.3 Objective of the study

- To investigate how common MSDs are amongst construction workers.
- To determine occupational risk factors of MSDs.
- To assess and analyse the consequences of MSDs on workers' life and work performance.
- To suggest ergonomic measures and policy changes aimed at the prevention of MSD.

1.4 Research questions

- What are the main risks of posing MSDs in construction work?
- In what ways do MSDs affect workers' productivity and the general well-being of their lives?
- Which actions can be taken for the prevention of MSDs?

1.5 Scope of the study

This research targets construction workers who are engaged in manual labour such as masons, carpenters, electricians, and operators of heavy machines. The study looks at different types of occupational diseases, working environments, and ergonomic management of MSDs.

2.0 Literature Review

2.1 Overview of musculoskeletal disorders

The diverse group of injuries known as MSDs affect both muscles and joints together with nerves. These injuries develop because of continuous strain and excessive pressure together with prolonged situations of uncomfortable postures (Holmström, 1992). A substantial number of MSDs affect construction workers because their occupations involve physical labor.

2.2 Occupational risk factors

The development of MSDs in construction workers is associated with several factors. Extended time performing the same actions creates muscle fatigue together with joint distress.

- Excessive weight-bearing during heavy lifting exceeds acceptable ergonomic thresholds which produce spinal injuries that strain musculoskeletal system structures.
- Extended positions requiring bending, twisting, and kneeling affect the musculoskeletal system so that chronic pain develops along with reduced mobility.

2.3 Impact of MSDs

MSDs impose serious negative effects on employee well-being by producing long-term pain durations along with disabilities that force workers to lose their jobs (Arias *et al.*, 2022). Economic strain on employers occurs due to medical expenses together with compensation payments and decreased work output caused by MSDs. Extended MSD exposure triggers emotional problems that produce symptoms such as stress alongside anxiety and depression.

DOI: 10.17492/JPI/NICMAR/2507100 ISBN: 978-93-49790-54-4

2.4 Preventive measures and ergonomics

Different ergonomic measures exist to reduce the risks of MSDs (Sousa *et al.*, 2023):

- Ergonomic task design aims to reduce repetitive strain combined with awkward postures at the workstation.
- Workers can reduce manual handling through the implementation of mechanical lifting aids as assistive devices.
- Training Programs deliver education about both secure lifting methods and early detection of symptoms to workers.

3.0 Research Methodology

3.1 Research design

The survey data of construction workers regarding their exposure to Musculoskeletal Disorder (MSD) risk factors and its influence on their work-life balance was analysed using the quantitative approach.

3.2 Data collection

Primary data was gathered using closed-ended questionnaires among a sample of 153 construction workers. The questionnaire captured information about the construction worker's job roles, work setting, experienced frequency of musculoskeletal pain, and ergonomic treatment practices.

3.3 Data analysis

Analytic techniques performed were descriptive and inferential statistics, including:

- Mean value, standard deviation, and frequency distribution were calculated for descriptive statistics.
- T-tests and Analysis of Variance (ANOVA) were employed to find the prevalence of MSD across different groups of workers.
- Regression Analysis was utilized to find the causes of MSD, or the risk factors that predict the occurrence of MSD.

4.0 Data Analysis and Findings

4.1 Descriptive statistics

Table 1 provides the average, the standard deviation, and the frequency distribution for the MSD risk factors of the individuals who responded to the survey (Guo, 2004). Repetitive Motions (Mean = 3.7190) has the highest mean value, indicating that repetitive motions are the most common activity. Heavy Lifting (Mean = 2.8431) is lower, suggesting it is a less frequent activity. Among pain variables, Pain in Lower Back (Mean = 2.0915) and Pain in Shoulder

DOI: 10.17492/JPI/NICMAR/2507100 *ISBN: 978-93-49790-54-4*

(Mean = 2.0327) have the highest mean values, indicating these areas are more frequently affected. Pain in Hip (Mean = 1.0784) and Pain in Ankle (Mean = 1.0588) have the lowest means, suggesting these areas are less commonly affected. Negatively skewed variables indicate that pain levels are often on the higher side (e.g., Repetitive Motions, Lower Back Pain), whereas positively skewed variables suggest that lower levels of pain are more common (e.g., Hip Pain, Ankle Pain).

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Repetitive_Motions	153	1.00	5.00	3.7190	1.21101	-.772	.196	-.294	.390
Heavy_Lifting	153	1.00	5.00	2.8431	1.11873	.058	.196	-.677	.390
Pain_Neck	153	.00	4.00	1.6993	1.32330	.277	.196	-1.136	.390
Pain_Shoulder	153	.00	4.00	2.0327	1.33977	-.127	.196	-1.146	.390
Pain_UpperBack	153	.00	4.00	1.8824	1.32258	-.040	.196	-1.156	.390
Pain_LowerBack	153	.00	4.00	2.0915	1.35413	-.265	.196	-1.126	.390
Pain_UpperArm	153	.00	4.00	1.7516	1.24224	.046	.196	-1.021	.390
Pain_Elbow	153	.00	4.00	1.3595	1.12749	.370	.196	-.747	.390
Pain_Forearm	153	.00	4.00	1.5294	1.13008	.148	.196	-.900	.390
Pain_Hip	153	.00	4.00	1.0784	1.30045	.980	.196	-.239	.390
Pain_Knee	153	.00	4.00	2.0261	1.30257	-.121	.196	-1.013	.390
Pain_Ankle	153	.00	4.00	1.0588	1.18230	.950	.196	-.086	.390

4.2 Inferential analysis

Statistical tests found significant differences in the levels of MSD for different job categories and years of experience. It was found in the analysis that construction workers who performed repetitive actions for long durations experienced the highest levels of pain (Holmström *et al.*, 1992). All variables in Table 2 have p-values = .000, meaning they are highly significant ($p < 0.05$). This indicates that the mean values of all reported factors (repetitive motions, heavy lifting, pain levels) are significantly greater than zero. Further, all results are statistically significant, confirming that these issues are widespread and not due to chance.

4.3 Regression analysis

The researchers conducted a regression analysis to examine how different risk elements influence MSDs in construction workers. The research model analyzed Pain Impact as the dependent factor while examining repetitive motion and heavy lifting activities and body part pain in regions such as the neck, shoulder, upper back, lower back, upper arm, elbow, forearm, hip, knee, and ankle.

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Table 2: Inferential Statistics of One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Repetitive_Motions	37.986	152	.000	3.71895	3.5255	3.9124
Heavy_Lifting	31.435	152	.000	2.84314	2.6644	3.0218
Pain_Neck	15.884	152	.000	1.69935	1.4880	1.9107
Pain_Shoulder	18.767	152	.000	2.03268	1.8187	2.2467
Pain_UpperBack	17.605	152	.000	1.88235	1.6711	2.0936
Pain_LowerBack	19.105	152	.000	2.09150	1.8752	2.3078
Pain_UpperArm	17.441	152	.000	1.75163	1.5532	1.9501
Pain_Elbow	14.914	152	.000	1.35948	1.1794	1.5396
Pain_Forearm	16.740	152	.000	1.52941	1.3489	1.7099
Pain_Hip	10.258	152	.000	1.07843	.8707	1.2861
Pain_Knee	19.240	152	.000	2.02614	1.8181	2.2342
Pain_Ankle	11.077	152	.000	1.05882	.8700	1.2477
Pain_Impact	16.233	152	.000	1.08497	.9529	1.2170

Table 3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.371	.202		1.842	.068
	Repetitive_Motions	-.083	.052	-.122	-1.591	.114
	Heavy_Lifting	.025	.061	.034	.408	.684
	Pain_Neck	.190	.051	.304	3.735	.000
	Pain_Shoulder	-.015	.062	-.024	-.243	.809
	Pain_UpperBack	.116	.067	.186	1.743	.083
	Pain_LowerBack	.159	.063	.261	2.523	.013
	Pain_UpperArm	.004	.068	.006	.063	.950
	Pain_Elbow	.091	.073	.125	1.243	.216
	Pain_Forearm	-.001	.068	-.001	-.013	.990
	Pain_Hip	-.013	.053	-.021	-.246	.806
	Pain_Knee	.048	.060	.075	.793	.429
	Pain_Ankle	-.099	.061	-.141	-1.616	.108
a. Dependent Variable: Pain_Impact						

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The value of R as 0.632 suggests a moderate correlation between the predictors and Pain Impact with 40% of the variance in Pain Impact is explained by the model. Also, the value of Durbin-Watson as 1.992 suggests no major autocorrelation issues in residuals. The regression model is statistically significant ($p < 0.001$) about ANOVA results, meaning at least one predictor significantly influences Pain Impact that marks for the meaningful regression model. Further, Table 3 confirms that intervention should focus on reducing Neck and Lower Back Pain since they significantly contribute to Pain Impact.

4.4 Discussion of findings

The study revealed that neck and lower back pain are the most frequently reported among the conditions of the MSD for the respondents. This subsequently made it difficult for them to move about, concentrate, and perform their work. From these findings, it is evident that greater emphasis should be placed on ergonomic designs that aim to ameliorate the working conditions of the employees.

5.0 Conclusion and Recommendations

5.1 Summary of findings

Construction workers have been confirmed to have a high prevalence of MSDs. High-risk tasks were heavy lifting, repetitive motions, and prolonged awkward postures (European Agency for Safety and Health at Work, 2002).

5.2 Recommendations

- Ergonomic Interventions: Implementing adjustable workstations and mechanical lifting aids.
- Workplace Safety Policies: Developing mandatory ergonomic training programs.
- Regular Health Screenings: Getting regular medical exams to catch early signs of MSDs.
- Job Rotation Strategies: cutting down the risky work extended for a long time.

6.0 Future Research and Policy Implications

6.1 Further research should explore

- The long-term impact of ergonomic interventions on MSD prevalence.
- Wearable technology’s ability to prevent work-related injuries.

6.2 Policy implications

Enforcement of safety regulations and the creation of an all-around MSD prevention program relies on government agencies and industry stakeholders helping with each other (European Agency for Safety and Health at Work, 2002).

DOI: 10.17492/JPI/NICMAR/2507100 ISBN: 978-93-49790-54-4

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DOI: 10.17492/JPI/NICMAR/2507100 *ISBN: 978-93-49790-54-4*