Prevalence of Job-Related Injuries among Construction Workers in Saudi Arabia

ABSTRACT:

The aim of this study was to determine the prevalence of work-related Musculoskeletal Injuries among construction workers, to evaluate injury-related sick leave, and identify factors contributing to injury.
the study was conducted at a Saudi construction company and 201 workers were approached and 149 were enrolled in the study. Jobs were categorized based on level of impact and jobs with similar levels were grouped together. Multiple Regression was used to evaluate stress categories and a cluster analysis was run on scaled and normalized types of stress and pain to identify factors closely associated with sick days taken. The results showed a response rate of 74.1%. A univariate analysis was used, and it demonstrated a 75.2% pain in upper and lower extremities, 61.7% pain was reported in upper extremities (Shoulder and Neck > Wrists and Hands > Elbow) and 12.8% pain reported in lower extremities (Lower back > Hips > Knees). In conclusion, the prevalence of work-related MSI in this large construction company was 75.2%. stratified multiple regression suggests job categories are good predictors of physical stress exposure and sick leave taken, also, the amount of force exerted, and vibration experienced by workers is closely linked to sick leave taken as well. Medium and high pain levels were linked to keyboard work, pushing / pulling, lifting and use of vibrating tools these workers would benefit from training emphasizing ergonomics and an explanation of proper techniques to handle tools. Lastly, applying new engineering controls would be helpful in the prevention of injuries that can minimize sick

Introduction: Musculoskeletal injuries (MSI) are generally defined as an injury affecting muscle, bone, tendon, ligament, articular and cartilage. The injury it could be acute as this study, or it could be chronic if it persists for 6 months.

Work related musculoskeletal injuries among construction workers have been conducted in this study. They are defined as an injury caused by an event leading to work restrictions or loss of productivity. They may result in absence from the workplace and impact on the activity of daily living outside of work.

Musculoskeletal injuries (MSI) are one of most common presentation in occupational health practice (1), especially among construction workers who depend on manual skills.

Ergonomics impact of musculoskeletal injury in the construction industry. Individual risk factors and ergonomic risk factors are related to excessive repetition of movement, force through lifting loads and posture of worker. Individual risk factors may result from bad health habits including smoking or obesity, lack of rest and inappropriate work practice due to disorientation or recent employment in the trade. These factors could affect the body part acutely or injury could be cumulative and result in permanent disorder and disability.

The physiologic response of musculoskeletal injury in the worker could detract from peak health and ability to work and result in fatigue and discomfort. The response presents as pain or loss of function of the body's part.

Differentiation between injury, disorder and disease is mandatory to understand the underlying causes and factors contributing to these conditions. The term 'disorder' gives an indication of the multifactorial nature of these conditions, which often develop from exposure to more than one risk factor and do not always fit into an 'injury' or 'disease' category (2). While injury can be defined as something that has occurred due to sudden event or incident. The term 'disease' is considered any condition that causes illness.

The pathology of MSIs is identical, whether they are work-related. Symptoms of work MSIs may include local or generalized pain, aching or discomfort; loss or hypersensitivity of sensation to touch, heat or pressure; loss of muscle strength,

endurance and/or flexibility; loss of ability to perform controlled movements, postural or balance reactions; and/or physical changes to muscle tone or bulk (atrophy, hypertrophy etc.), skin color and temperature, inflammation, abnormal alignment of joints, loss of joint range of motion or stability (3)

The objective of this study is to measure the prevalence of work related to physical stress in the construction industry and to obtain characteristics and distribution of musculoskeletal injury in Saudi Arabia. There are several factors that have considered in this study including ergonomics, high repetitive motions, frequencies, recovery time, force and using of vibrating tools.

Outcome measured would be the impact of the injury to work productivity recorded as sick days taken, in addition to estimates of the cost of paid sick leaves.

Methodology: This project employs a cross-sectional study design to evaluate the prevalence of (MSI) among construction workers in Saudi Arabia. The population was recruited in July-August 2016 from a construction company that builds infrastructure, commercial and residential buildings. The company employs several thousand people throughout the country of Saudi Arabia.

The sample is composed of 149 de-identified male construction workers who were divided into 9 job categories (electricians, ceramic workers, painters, carpenters, iron workers, crane operators, laborers, plumbers, masons, and others). The population was recruited from 3 cities in the eastern region. In one city I recruited 73 employees from different work sites; in the second city I recruited 44 employees from one work site and in the third city I recruited 32 employees from one work site. Workers from 18–60 years of age were invited to participate in this survey. Exclusion criteria: individuals unable to complete the survey, workers who have less than 6 months of experience within the same job and those with persistent musculoskeletal disorders were excluded. The company authorized performance of this work. A verbal consent was obtained from each subject. Participation was voluntary. All subject identities were kept confidential.

 A validated questionnaire (4) was administered by interview in English to 30% of the participants. I used translators for 50% of participants who speak Urdu, Bangladeshi, Tamil. The remaining 20% were administered the questionnaire by verbal translation into Arabic. The questionnaire is included in Appendix A. Demographic information, work related history, presence, or absence of any musculoskeletal injuries in the last 6 months, affected body parts, the intensity of pain on a numerical rating scale (NRS) (5) and any treatment received were recorded.

The trades were categorized based on repetition of movement, posture, and ergonomics of the worker during his tasks and physical stress either by using

vibrating tools or force in lifting. Workers were stratified into 3 groups by stress related job categories. Painters, electricians, and crane operators were classified as low impact. Ceramic workers, plumbers, other workers were categorized as moderate impact. Whereas iron workers, masons, carpenters were placed in a high impact group. The initial data entry was performed using Excel 2010 (Microsoft Corporation); statistical analysis was performed using SPSS 21.0 Software (SPSS, IBM Inc.). Univariate analysis and descriptive statistics were calculated, including proportions, means, medians, and standard deviations, for age, job, smoking status, educational status, daily work hours, usual working posture, affected body part, type of pain and factors impacting pain. These can decrease and increase intensity of pain. Type of treatment, use of PPE and how pain affects daily activities were recorded. Bivariate analysis was performed using chi square to assess the pain and sick leave taken. Data were transformed to a normal distribution on multiple regression was used to evaluate stress category, sick days taken, and pain experienced by the 3 groups of workers. Cluster analysis was performed using scaled and normalized types of stressors and pain experienced by workers, to determine which factors are most closely associated with sick days taken.

Results: One hundred forty-nine of 201 workers completed the questionnaire of 201 reached for a response rate 74.1%. Table 2 describes demographics results. Univariate analysis indicates that 75.2 % of workers reported pain in their extremities and joints following employment in the construction trade. We found 61.7% of workers reported upper extremity pain whereas 12.8% reported pain in lower extremities. Additionally, 25.5% reported that they were not suffering from pain.

Table1: Prevalence and severity of pain during the last 6 months

		Total (n=149)	(%)
Experience of pain			
Yes		112	75.2
No		37	24.8
	Numerating Rating scale for pain of (75.2%)		
0	No pain	37	29
1-3	Mild pain (nagging, annoying, interfering little with ADLs)	94	17.4
4-6	Moderate pain (interferes significantly with ADLs)	14	26.8
7-10	Sever pain (disabling; unable to perform ADLs)	4	24.8

*ADL (Activity of daily living)

Table2. Demographics

All participants are male predominantly from India and Pakistan with 42%, from Southeast Asia 35%, from North Africa 23%. Most workers completed primary school were nonsmokers and about half worked in their progression for more than 1 year (Table 1). We calculated sports participation and found no relationship with injury (RR= 0.93).

Income	Total (n=149)	(%)	RR of Pain
<3000 SR	143	96.0	1.52
>3000 SR	6	4.0	0.47
Practice sports			
Yes	53	35.6	0.93
No /little	96	64.4	1.23
Current Smoking			
Yes	53	35.6	1.1
No	96	64.4	0.76
Educational level			
Didn't attend school	42	28.2	-
Primary school	50	33.5	
Intermediate school or higher	57	38.3	
Duration of work (year)			
<1 years	76	51.0	0.85
>1 years	73	49.0	1.62

Table3. Job factors commonly associated with pain.

	Total (n=149)	(%)	RR
Repetitive motion			
Yes	145	97.3	1.52
No	4	2.7	0.48
Lifting heavy materials			
Yes	69	46.3	1.20
No	80	53.7	0.55
Pushing / pulling			
Yes	113	75.8	1.11
No	36	24.2	0.75
Pinching			
Yes	115	77.2	0.97
No	34	22.8	1.07
Gripping			
Yes	131	87.9	0.88
No	18	12.1	1.55
Rising hands above shoulders			
Yes	98	65.8	0.90
No	51	34.2	1.40
Back working			
Yes	67	45.0	1.06
No	82	55.0	0.83
Using hammer			
Yes	64	43.0	1.03
No	85	57.1	0.90
High vibrated tools			
Yes	34	22.6	1.3
No	115	77.2	0.3

Classification of job impact:

It has been classified according to ergonomics, repetitive motions, force, and work stress.

Table 4. Classification of stress experienced by trade.

Job title(department)	Total (n=149)	(%)
Milde impact		
Crane operator	9	6.0
painter	10	6.7
electrician	12	8.1
Moderate impact		
Ceramic worker	5	3.4
plumber	9	6.0
other	30	20.1
High impact		
iron & steel worker	14	9.4
Maison	18	12.1
laborer	30	20.1
carpenter	12	8.1

Multiple regression was used to evaluate stress category, sick days taken, and pain experienced by the 3 groups of workers. The result demonstrates a relationship among the sick days taken and pain with borderline significance. The low impact group may be less injured and requires fewer days. The job stress group experiences additional stress and requires more sick leaves. The most stressed group requires the greatest sick leaves. The qualitative analysis of job-related physical stress by category, demonstrates that workers with low physical stress jobs experience less pain and take ≤ 3 days of sick leave per 6 months, workers with moderate physical stress jobs experience more pain and take ≤ 7.5 days of sick leave, and workers with high physical stress jobs experience the greatest pain and take up to 10 days of sick leave. These associations are borderline significant (P=0.07, 0.08, 0.08).

Figure 1. Illustrates the relationship between stress categories of job and sic days taken.
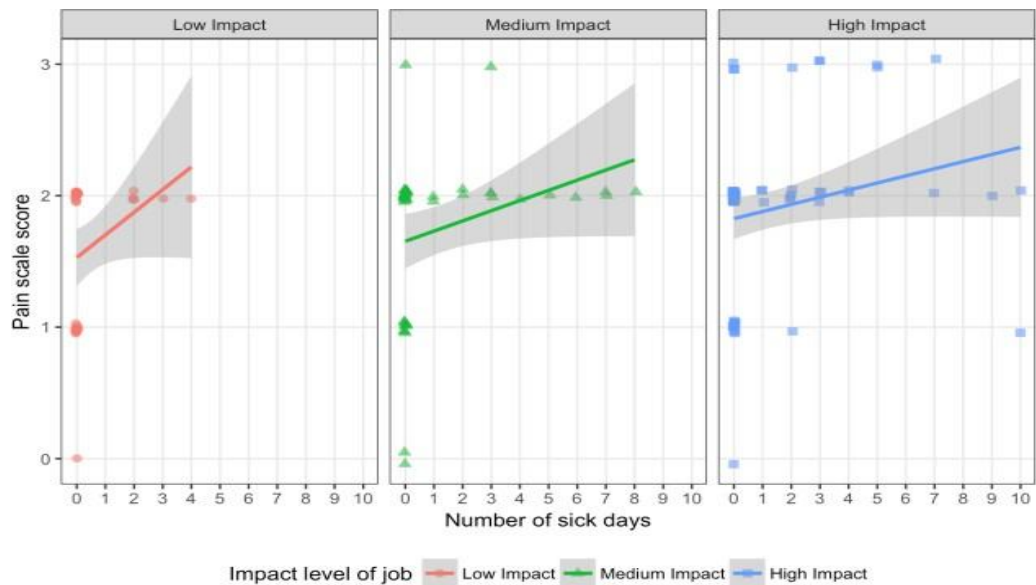
Frequencies of activities were calculated, and a correlation matrix was generated with Spearman Rank Correlation on these non-parametric data to determine which factors were most closely associated with sick days taken.

Figure 2. illustrates clustery of work activities.
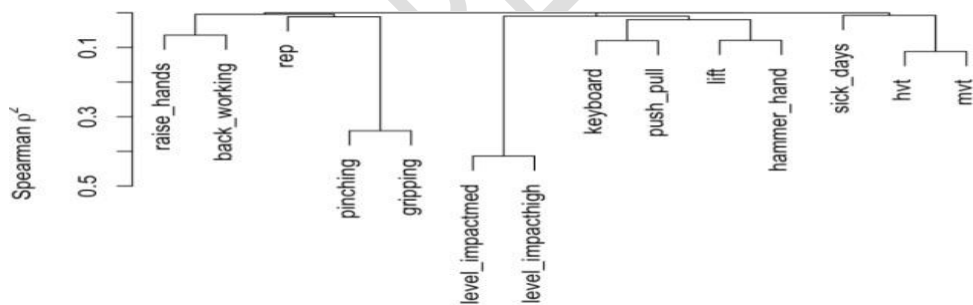
Activities like use of keyboard, pushing/pulling, lifting, and hammering are associated withmoderate to high pain. sick days taken are closely related to use of vibrating equipment.

Discussion: After conducted this study in the construction field, it showed that construction workers are at risk for MSIs that are a predictive of early retirement, disability, or deficit in work productivity, especially in developed countries whereas the construction is highly implemented. Based on these prevalent findings (75.2%) of MSIs found in this study, the prevention of MSIs among construction workers is significantly important. However, to target workplace interventions further knowledge on the mechanism and type of injury is required. My study provides ergonomics, repetitive strain motions, force, and usage of vibrating tools, based on a random sample.

However, some limitations regarding the healthy worker effect has been noted, especially in young age group, First, It could some of the participants already has MSI and hide that because of his afraid of ending his services, Second, exaggeration of pain either to change their jobs or they are not healthy to handle this kind of job industry, Third, overwhelmed work from the supervisors could has bad impact on the workers psychologically and physically which possibly leading to a higher prevalence that we found.

Our response rate of 75.2 considered good, reflecting our effort to increase the response rate by asking the participant to encourage their friends. All participants are male and reflect the work force that 100% male.

These results are generalizable for manual workers in specific trades.

There may be seasonal differences in prevalence of MSDs (6), it seems likely that musculoskeletal complaints will more prevalent during the winter than during the summer, but we should consider that in future with probably larger sample size,

The anatomical classification of injuries is one of the limitations in this study. It considered neck injuries with upper extremities while lower back injuries with lower extremities, which are not belonging to the extremities and this study was focus on upper extremities more than lower extremities, that's explain the difference between the two percentages, which is back pain supposed to get the highest percentage than the other parts of body.

The strong points in this study for being one of the rarely studies in construction trade of Saudi Arabia, since each company has its own closed system, we had been conducted the workers who joined construction during the past 6 months to avoid recall bias that may happen, the workers with chronic disorder or injury has been excluded.

The company would benefit from applying new engineering controls and focusing on ergonomics to avoid this high percentage of injuries, other consideration would be the cost effectiveness and cost benefit study to estimate the paid sick leaves days costing to the company.

Conclusion: The prevalence of work-related musculoskeletal injuries in this large construction company was 75.2%; pain scale and sick leave taken are significantly related (OR=1.42; P=0.002). Stratified multiple regression suggests job categories are good predictors of physical stress exposure and sick leave taken. The amount of force exerted, and vibration experienced by workers is closely linked to sick leave taken as well. In this study, most workers were not from Saudi Arabia, mainly imported from outside and were generally young and inexperienced.

Recommendations: These workers would benefit from training emphasizing ergonomics, an explanation of proper techniques to handle tools and effective work procedures after implementation of new engineering controls, whereas administrative, work practice controls and PPE may be appropriate in some cases only.

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