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ARTICLE

A Study on the Prevalence of Musculoskeletal Disorders among Ageing Workforce of Indian Construction Industry

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ABSTRACT

Ageing work force is one of the leading causes behind the depletion in the growth rate of the labor force in construction industries. Construction industry is a paramount source of employment worldwide after agricultural industry explicitly in urban areas. Manual material handling in construction industries causes musculoskeletal disorders affecting both upper and lower extremities of the body. Studies on lower limb problems due to dynamic work like handling of heavy loads in construction industries are scanty. To analyze the level of exertion, ergonomics risk factors and the prevalence of work-related lower limb disorders among the young and elderly construction workforce. 20 male construction workers in the age group of i) 20 to 30 years (golden age group); ii) 50 years and above were selected from a local construction site in Mumbai. Demographic data like age, height, weight, BMI, body fat, waist hip ratio and risk assessment by questionnaires study comprising QEC, NMQ, VAS, and LEFS were collected. Compared to the golden age group, the elderly subjects were found to feel more discomfort in their lower back, knee and calf regions of lower limb due to immoderate forces and motions tolerated by their lower limbs during their daily work. Muscle pliability and proper coordination diminishes with age and it is appearing to be the most probable reason behind the pain experienced in their lower limbs might be due to improper techniques and postures. For elderly workers, age related limitations become an additional factor to maintain their normal work-life.

1. Introduction

Age and occupation are the intertwined factors that can lead to work related musculoskeletal disorders (WRMSD). Ageing being a vital disquiet among the workforce, so to assign the kind of aligned job to the worker as per their demographic details, requisite changes in the workplace has to be made. Age is not the sole risk factor for WRMSD, if precautions can be taken beforehand [1]. Recently, ageing population has become a considerable apprehension in developed countries. The ripening industrial labor force under present industrial structure and in the absence of appreciable increase in productivity and proper policy measures, creating a dearth in the labor force, leading to economic deceleration [2]. Ageing workforce set bigger pressure on the requirement of higher labor productivity, but education and skills of experienced workers will become a still more important means of complementing the declining growth in the numbers of work force. Labor hungry growth industries like constructions, retail,

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cafes, restaurants etc. are mostly affected [3]. Older workers are greatly valued due to their immense work and life experiences and skills that they had built up over a number of years but many factors which affect them to continue their work life in this industry such as incapability to do the strenuous physical jobs, age related health issues and proneness to injury which needs to be overcome, as the inflow of younger workforce is declining due to lack of job uncertainty and security [4] The most appropriate way to deal with this situation will depend on the pre-selection process of recruiting workers for a particular work on the basis of age and gender, and other physiological & psychological characteristics of the workers of the industry concerned as age affects the mobility, flexibility and strength of a person i.e. human kinetics and kinematics that hinders them to perform the normal work. Various industrial jobs involve various types of heavy labor work or manual material handling and many industrial workers might be in a high-risk category depending on the type of Musculo skeletal problems they were prone to.

In developing countries like India, among all the industries, construction industries provide much needed work opportunities for some of the poorest and most marginalized sections of society (WIEGO). To find the relationships between the level of exertion, ergonomics risk factors and the prevalence of work-related musculoskeletal disorders among the young and elderly construction workforce, this experimental study had been carried out.

2. Methodology

A cross sectional study was conducted among 20 construction workers from a local construction site in Mumbai. The study was commented after permission from the relevant authorities. A written consent was taken from the authority and the details of the study were explained. Information about the study was given at their workplaces. Selections of the subjects were based on non-probability convenient sampling. Selection of the construction site has been a mix of convenience and chance. Data was collected with the help of questionnaire, observation, photography and video recording technique.

There will be following groups:

(1) Elderly male workers of age 50 years and above

(2) Young male workers of age 20-30 years of same occupation

This part of the study was carried out with the help of questionnaire which comprised of demographic data and risk assessment data by Quick Exposure Checklist (QEC), Lower Extremity Functional Scale (LEFS), Nordic Musculoskeletal Questionnaire (NMQ), Visual Analogue Scale (VAS).

2.1 Data Analysis

All unconditional rejoinders for each subject were entered into an excel database and encrypted with numeric values before being analyzed. All collected data were encapsulated using descriptive statistics of mean, standard deviations (±SD) and percentages. Means and standard deviations (±SD) were used to describe the demographic details such as age height, weight, years of experience in that particular job. MSD prevalence rates by body site are calculated as a percentage of all the respondents. Preva-

Table 1. Basic descriptive characteristics of subject groups (N=10)

Variables	Elderly Men (n=10)			Young Men (n=10)			df	t
	Mean	SD	Range	Mean	SD	Range		
Age (years)	58.58	5.68	50.0-69.0	25.50	3.73	20.0-30.0		
Height(cm)	165.63	3.86	155.0-180.0	165.68	9.46	157.5-175.5	8	-0.05
Body Mass(kg)	65.5	11.1	56.9-73.1	63.43	8.20	51.8-74.9	8	0.72
Body Fat (%)	19.08	4.80	15.4-28.7	14.01	3.31	11.01-33.0	8	5.94*
BMI	20.23	6.54	17.6-26.58	23.18	5.47	19.4-32.3	8	3.720*

*p<0.01

Table 2. Occupation History

Variables	Elderly Men (n=10)		Young Men (n=10)	
	Mean	SD	Mean	SD
Working days/week	6.8	0.44	6.8	0.44
Daily Working Hours (%)	8.4	0.81	10.5	1.02
Overtime work (%)	3.2	1.77	4.0	3.99

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lence of all ciphered categorical data were tabulated and charts were plotted for reported symptoms. Statistical associations between independent variables and symptoms in any body site are evaluated using Pearson's Chi square and paired t-test was used to see the work exposure among the technicians experiencing the strain using to see the exposure among the technicians experiencing the strain using Statistical Package for the Social Sciences (SPSS 16).

3. Results and Discussions

Means and standard deviations for physical characteristics of the workers participating in this study are discussed in Table 1. In Table 2, the working schedules were quite hectic for the workers. They used to work almost daily 8 to 10 hours if they had a project in hand and most of the times due to heavy workload, they had to do overtime.

3.1 Characteristics of Work-related Musculoskeletal Disorders

Construction workers reported high prevalence of work-related musculoskeletal symptoms. Percentage of workers reported having discomfort associated with work tasks. The 12 month and 7- days prevalence rated of work-related musculoskeletal disorders reported by the workers were collected. Most of the respondents had reported low back problem in last 12 months as well as last 7 days, followed by knees (30.56%), ankles/feet (18.12% and 15.12%) and upper back (18.36% and 8.16%), the neck (8% and 4%), shoulder (4% and 4.08%), and wrists (3% and 3 %). It shows that the low back, knees, ankles/feet, upper back, neck and shoulders are the most commonly affected body parts among the workers. The result of the present study is very much similar to the study done by Wadell [5] who reported that the number of work-related MSD complaints, suffered during the past 12 months, caused or made worse by work and maximum reported problem were low back pain and lower extremity functional disorders that may be characterized as ephemeral diseases because the pain often subsides and disappears for a while and recurs a few months or years later. A large number of MSDs that recurs weekly were temporary in that the pain (or other symptoms) disappears with rest or when an activity is changed.

The majority (70%) of the respondents had reported work as the cause for their musculoskeletal symptoms while few (25%) reported accident as the casual factor for their musculoskeletal symptoms. Boschman et al [6] concluded a similar result where majority of the workers in construction sites reported their working activity as the most general cause of their proneness to musculoskeletal problems followed by accidents [7].

The subjects were also asked about their intensity of pain or discomfort. It showed that almost more than half of the respondents reported that the pain intensity was mild (60% in young respondents and 40% in elderly respondents), with 25% severity in young respondents and 40% severity in elderly respondents, but very few as extremely severe (15% in young respondents and 20% in elderly respondents). This result is in accordance with the study conducted by the Health and Safety Executive [8] which showed similar reported pain intensity among the older and younger workers. The study said that mild pain starts within a few months of work among the younger age group which turns into severity with age, as they ignore the pain because of their withstanding capacity. But with age this pain turns into chronic severity, so older population suffers from chronic pain rather than mild symptoms.

The frequency of musculoskeletal symptoms showed that nearly 35% young and 45% elderly respondents experience musculoskeletal discomfort in one or more times a week while 35% young and 20% elderly respondents experience musculoskeletal discomfort in one or more times a month whereas 20% young and 30% elderly respondents reported that they suffer daily and few of them (10% young and 5% elderly respondents) had reported the musculoskeletal discomfort one or more times a year. It was observed that majority of the workers experienced pain one or more times a week, so it can be said that the frequency of pain is quiet high among the respondents. Further it was found that the rated absenteeism from the work due to musculoskeletal symptoms. Most of them used to continue to work irrespective of their body discomforts.

Table 3. Relationships of work-related musculoskeletal disorders and the personal characteristics which are related to the work-related musculoskeletal disorders

Variables		Frequency of WMSDs	WMSDs (%)	Chi-square	p-value
Age	21-30 years	3 out of 10	15	5.208	0.023*
	50 years and above	9 out of 10	45		
Work Experience	>5 years	4	20	2.649	0.481
	>10years	9	45		
	>20 years	7	35		

significant* at df=1

There were some variables in the personal characteristics which were related to the work-related musculoskeletal disorders. Table 3 showed that the association of WMSDs were significantly associated with increasing age

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(χ^2=5.208; p=0.023) but no significant association were found with gender and work experiences. The prevalence rate of work-related musculoskeletal disorders was highest (45%) among the respondents who were at age group of 50 years and above. Further it was observed that the females (40%) were more prone to work related musculoskeletal disorders. Highest percentage of respondents (45%) experienced their first episode of WMSDs in their 10 years and above work experiences. Almost all of the respondents were doing overtime irrespective of age and gender and thus most of them found to be more prone to work related musculoskeletal disorders. Similar conclusion was drawn by Bodhare et al. [9] which said that globally, MSD is the largest single cause of work-related health issues, accounting for over 33% of all newly reported occupational illnesses in the general population and 77% in construction workers. Most of the elderly workers experienced discomforts more than one times a week and this was more frequent among the older workers compared to younger group both in case of males and females. Kuorinka et al. [10] observed similar relationship between personal characteristics and WRMSDs.

3.2 Musculoskeletal Symptoms among the Workers

Construction workers perform specially loading and unloading tasks were all analyzed using Nordic Questionnaire. The analysis showed that in different body parts the symptoms were maximum in knees and lower back (90% and 80% in elders; 65% and 65% in young respectively), followed by ankle/feet (60% in elders and 20% in young) and shoulder (45% in elders and 30% in young). For all the body parts the exertion level was high in the lower extremities than upper extremities while load carriage. This result is in accordance with the study conducted by the Health and Safety Executive [8] and Boschman et al [6] which showed maximum both elder and young workers had been suffering from low back pain followed by knees and ankles. Again, in their study it was revealed that elder workers were the most vulnerable age category.

3.3 Magnitude of the Musculoskeletal Discomfort among the Workers

Visual analogue scale (VAS) was used to measure the magnitude of the musculoskeletal discomfort experienced by the workers after their work. It was used to analyze the musculoskeletal strain in different body parts perceived by them. They rated the strain after their work exposure that is represented in Table 5.

The analysis of above table shows that there is a significant difference between the means of young and elderly workers scores of lower backs (t=-2.881, p=0.009); knees (t=2.598, p=0.017); calf (t=-2.331, p=0.030); thighs (t=-2.661, p=0.015). The negative t value shows that the intensity of pain has increased in the respective regions with age. Health and Safety executive [8] reported significant differences between the elderly and younger workers while assessing the pain intensity during the work of the construction workers.

Table 5. Reported intensity of pain after work exposure

Body Regions	Young	Elderly	T test	P value
Neck	0.0204	0.1222	-1.000	0.329
Shoulder	0.0346	0.2245	-1.429	0.169
Upper Back	0.7372	1.9837	-1.000	0.329
Lower Back	0.6531	1.5102	-2.881	0.009
Wrist	0.0612	0.1324	-1.385	0.182
Hips	0.0001	0.2657	-0.275	0.217
Thighs	0.0650	0.6335	-2.661	0.015
Buttocks	0.0000	0.2020	-1.000	0.329
Knees	0.1837	0.8776	-2.598	0.017
Calf	0.2178	0.9225	-2.331	0.030
Ankles	0.1783	0.4060	-1.000	0.329
Feet	0.1632	0.3645	-1.385	0.182

3.4 Lower Extremity Exertion

Functional assessment of the lower extremities is an essential aspect of the evaluation of both young and elderly people. To evaluate whether objective physical function tests can predict subsequent impairment in older people, we conducted this research. Objective tests of lower-extremity function were highly predictive of subsequent impairment among non-disabled older people living in the group. Measures of physical performance may identify older persons with a preclinical stage of disability who may benefit from interventions to prevent the development of frank disability. Extreme exertion was found maximum among elderly (40%) and moderate exertion (40%) was maximum among young respondents. Health and Safety Executive research [8] has also shown that in many workplaces where constant static standing or repetitive walking activity are involved, especially knee conditions are a concern and appear to be similar to conditions in other areas of the body, such as the lower back and ankles. Staff can suffer acute as well as overuse injuries, although overuse injuries appear to be more common. Elderly people showed extreme exertion in lower extremity in physical demanding work compared to younger group due to loss of flexibility and proper coordination of muscular activity

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and therefore lack of balance tends to make the exertion level higher in that case. The findings of the above study have shown similar trend like ways.

4. Conclusions

In the present study of 20 construction workers, it is found that the prevalence of musculoskeletal symptoms was high among the elderly workers compared to that of younger workers. The body parts that are mostly affected apart from upper limbs are lower back and lower extremities as this are the regular affected body sites for the construction workers but mostly got ignored until immobility ceased their work-life. It was found that the highest prevalence of MSD is observed in lower back causing severe back pain, followed by pain at knee, feet/ankle and pain at upper back regions as well. Most of the elderly workers claimed to perceive discomfit in their lower back region and knees when they are back to home. The workers claimed that this pain was due to the excessive force and motions used during their daily manual material handling work and the impact is felt to be the cumulative effect of ignored activity i.e., continuous walking activity during manual material handling. It was presumed that the back pain the workers were experiencing might be a result of their ignorance in the correct and ergonomic techniques in the mode of handling load. Musculoskeletal injuries, such as lower back pain, knee pain, slips and falls due to age related changes were very common in older workers, therefore, maintaining musculoskeletal health was important. Work stations and job tasks needed to be matched to the capacity of each worker. The workplace can be designed and redesigned as per the requirement of all the workers in order to accommodate both younger and older workers with the ability and desire to adapt themselves with the positive changes in the industry. This study will also help the employers to keep their aging employees healthier and working longer. Ergonomics programs and workplace design strategies will help the older employees perform their jobs productively and safely by reducing the 'performance gap'.

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