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### Original article

# Impact of musculoskeletal disorders and social determinants on health in construction workers

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#### ABSTRACT

**Background:** Musculoskeletal disorders are common sequelae in construction workers due to the ergonomic hazards they face at work and have a significant impact on health. The health impact is aggravated by associated conditions such as socio-economic status, migrant status, detrimental job characteristics and poor housing and environmental conditions. **Objectives:** 1) To evaluate the socio-demographic characteristics, job characteristics of the construction workers 2) To assess the impact of musculoskeletal disorders on well being (general, physical, mental health and activity limitation) 3) To evaluate the social determinants which play a role affecting these components of health. **Material and methods:** A semi structured questionnaire was used to obtain information from construction workers via a face to face interview divided into the following parts, namely 1) Socio-demographic characteristics 2) Evaluation of general, physical, mental health, activity limitation and the duration of work days affected through the Healthy Days Module 3) Evaluation of social determinants of health. **Results:** A total of 132 construction workers consented to participate and were sampled in the study. 26 (20%) of the workers reported at least one episode of musculoskeletal disorder and 35 (27%) reported morbidity on the healthy days module in the previous month. The mean days affected in the MSD group were  $8.65 \pm 1.44$ ,  $3.73 \pm 1.75$ ,  $2.35 \pm 0.68$  and  $5.33 \pm 2.35$ ,  $3 \pm 1.32$ ,  $2.33 \pm 0.5$  in the non MSD group. The commonest health problems included back or neck problems followed by arthritis. Logistic regression analysis showed a positive correlation with the outcome of ill health and the social variables examined with a Nagelkerke R<sup>2</sup> value of 0.7 and the largest variation in means on the domains of job security, availability of safe food and drinking water and community support. **Conclusion:** There is a significant quantitative impact of musculoskeletal disorders on general well being, the physical and mental dimensions of health in addition to causing activity limitation. Proper pre-placement training, ergonomic measures along with provision of job security, availability of safe food and drinking water and community support can lead to optimal health, functioning and fewer work days lost in this high risk group.

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### 1. Introduction

With an estimated workforce of 26 million construction workers in India, [1] it is paramount to implement measures to evaluate and promote health in the group, especially in context to the numerous factors contributing to the detriment of health among them. Not only does the nature of work in itself preclude them to physical hazards at their workplace, the socio-economic status among these workers aggravates their risk for ill health. The

construction industry in India is characterized by poor work habits, lack of ergonomic practices, prolonged work hours with inadequate rest periods, hazardous working conditions, migrant labor with poor rights and pay at the workplace and poor healthcare access.

Musculoskeletal disorders are the commonest physical ailments among these workers with an estimated 33% prevalence in the general population and a prevalence of 77% among construction workers. [2] Musculoskeletal disorders not only hamper productivity at work, they are also the leading cause of sickness absenteeism, days of work lost and disability. The etiological factors playing a role in the occurrence of this condition

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run a gamut from poor working conditions, lack of adequate training, poor physical postures, prolonged working hours with inadequate rest periods in between and also psycho-social factors such as support from co-workers, supervisors and other factors such as job pace and job monotony. [2] Musculoskeletal disorders have an impact on all dimensions of health, both through direct and indirect mechanisms. There is an impact on the physical dimension of health with physical injuries, delayed healing due to the repetitive nature of the injuries, lost workdays which thereby impact the other dimensions of health including mental health and thereby the social and emotional dimensions as well. There are indirect implications on the socio-economic status due to lost work, sickness absenteeism, healthcare costs and even hospitalization in some workers.

This burden of musculoskeletal disorders can be assuaged by simple measures such as proper ergonomic practices, job training and adequate periods of rest between strenuous work. To understand the mechanism through which musculoskeletal disorders impact health, the present study was conducted to estimate the burden of musculoskeletal disorders in construction workers, a quantitative impact on the various dimensions of health and activity limitation and social determinants affecting health.

## 2. Material and methods

A semi structured questionnaire was used to obtain information from construction workers via a face to face interview divided into the following parts, namely 1) Socio-demographic characteristics 2) Job characteristics including work type, nature and duration 3) Evaluation of general, physical, mental health, activity limitation and the duration of work days affected through the Healthy Days Module. 4) Social determinants of health through a twenty item questionnaire

Socio-demographic information obtained included the age and sex of the respondents, the nature of the job performed, job duration in the current industry and the socio-economic status.

A one month prevalence of musculoskeletal disorders was obtained as per the operational definition. A construction worker was considered to be suffering from MSD if he had one of the symptoms (pain, numbness, tingling, aching, stiffness or burning) in the past year that lasted at least a week or more or occurred at least monthly with a pain scale rating of moderate on a 5-point scale. This definition was devised and validated in a study on work-related MSD conducted by Bernard et al. at the National Institute of Occupational Safety and Health (NIOSH). [3] The duration, severity of symptoms, number of episodes and the amount of pain on a 5-point scale were recorded. Workers who had a previous history of work-related injury, accidents, joint trauma and similar medical and surgical conditions were excluded from the study.

The overall health status, mean duration of general, physical and mental health affected was obtained and compared across the workers in the MSD and non MSD group using the healthy day measures. The Healthy Days Measures are a brief set of survey-based questions designed to assess health and health related

quality of life. [4, 5] It contains a set of four core questions which provide a summary measure of the days when physical health, mental health were not adequate, the number of days activities were limited and an overall assessment of general health. In addition, the healthy days measures also contain two other modules, the standard activity limitation module and the symptoms module to evaluate health.

Social determinants of health were evaluated through a twenty item questionnaire which was then coalesced into six domains of medical care accessibility, community support, housing, job security, availability of safe food, drinking water and sanitation and a provident environment for self and family. A binary logistic regression analysis was performed with overall health as a binary outcome and social determinants of health as predictors.

Data analysis was done using PASW (SPSS) software, version 18. The statistical measures obtained were proportions, measures of central tendency, dispersion and binary logistic regression.

## 3. Results

Sampling was performed in two construction sites and purposive sampling was employed including all available workers at the sites who were willing to participate in the study. The questionnaire was administered after informed consent was obtained. A total of 132 construction workers consented to participate and were sampled in the study.

The sex distribution of the sample consisted of 110 (85%) males and 22 (15%) females and the age ranged from 22 to 64 years. The predominant work profiles included workers who were manual labourers, carpenters, brick layers, painters, electricians, plumbers and welders.

Socio-economic status was calculated using the Kuppuswamy scale which is a composite index of education, occupation and income and the workers were then classed into three groups viz. upper class, middle class and lower class. 106 (80%) workers belonged to the lower and upper lower class and the rest belonged to lower middle class as per Kuppuswamy classification of socio-economic status. These details are presented in table 1.

**Table 1: Socio-demographic characteristics**

		Total
Male	110 (85%)	132
Female	22 (15%)	
Lower class	98 (74.24%)	132
Middle class	26 (19.69%)	
Upper class	8 (6.06%)	

26 (20%) of the workers reported at least one episode of musculoskeletal disorder during the past one month as per the operational definition. 35(27%) workers reported morbidity on the WHO healthy days module in the previous month. The mean duration of days affected by ill health on the Healthy days core

module were measured for physical, mental health and activity limitation in both the groups. The mean days affected in the MSD group were  $8.65 \pm 1.44$ ,  $3.73 \pm 1.75$ ,  $2.35 \pm 0.68$  and  $5.33 \pm 2.35$ ,  $3 \pm 1.32$ ,  $2.33 \pm 0.5$  in the non MSD group. The commonest health problems included back or neck problems followed by arthritis. This is presented in table 2.

**Table 2. Healthy days measures - days affected**

	Physical health	Mental health	Activity limitation
MSD group	$8.65 \pm 1.44$	$3.73 \pm 1.75$	$2.35 \pm 0.68$
Non MSD group	$5.33 \pm 2.35$	$3 \pm 1.32$	$2.33 \pm 0.5$

Mean scores were obtained on the social determinants of health which were combined into six domains, namely medical care accessibility, community support, housing, job security, availability of safe food, drinking water and sanitation and a provident environment for self and family among the affected and not affected group of workers who showed impairment on the healthy days measures.

The largest variations in means were obtained on the domains of job security, availability of safe food and drinking water and community support. Logistic regression analysis showed a positive correlation with the outcome of ill health and the social variables examined with a Nagelkerke  $R^2$  value of 0.7. These results are presented in table 3.

**Table 3. Social determinants of health**

	Not affected Mean $\pm$ SD	Affected Mean $\pm$ SD	Total Mean $\pm$ SD
Family support determinants	$11.82 \pm 2.402$	$12.31 \pm 1.605$	$11.95 \pm 2.224$
Healthcare access determinants	$4.58 \pm 0.988$	$4.71 \pm 0.750$	$4.61 \pm 0.930$
Housing determinants	$7.36 \pm 2.107$	$8.00 \pm 1.698$	$7.53 \pm 2.021$
Nutrition and sanitation determinants	$7.61 \pm 2.234$	$8.74 \pm 1.482$	$7.91 \pm 2.117$
Occupational determinants	$9.51 \pm 2.471$	$11.11 \pm 2.285$	$9.93 \pm 2.518$
Community support determinants	$6.60 \pm 1.484$	$7.43 \pm 1.267$	$6.82 \pm 1.471$

Nagelkerke  $R^2 = 0.7$

#### 4. Discussion

Measuring health and the factors affecting the same is fraught with difficulties on a community based level due to the issues of objectivity and reliability. Health-related quality of life (HRQOL) is an important measure of a patient's perception of his/her illness. Various measures have been developed to measure quality of life both in a disease specific context and in the general context. [6] The current study was conducted to obtain an objective measure of health by measuring the number of days impacted due to poor health either physical or mental and the number of days normal activity was limited due to the same. The underlying causes for this impact were evaluated, including the commonest cause of ill health in construction workers, namely musculoskeletal disorders and also other confounding factors such as social determinants including medical care accessibility, community support, housing, job security, availability of safe food, drinking water and sanitation and a provident environment for self and family. A one month prevalence of 20% was obtained in the current study among construction workers. The commonest health problems included back or neck problems followed by arthritis. Holstorm et al [7] who studied musculoskeletal disorders among construction workers in Scandinavia implicated physical risk factors such as awkward posture and associated psychosocial factors. This is consistent with the situation in construction workers in India who often work for prolonged hours with improper loads in awkward positions due to the lack of ergonomic training. The estimates of

the prevalence of musculoskeletal disorder among construction workers vary with location, the operational definition used for enrolling cases in the study, the cultural context at the location of the study affecting both the nature of the workers in defining ill health, pain and also the work specific factors in each location. However, a one month prevalence in the current study of 20% represents a significant burden of disease and thereby a factor limiting productivity and affecting health. Health is also dependant on several other factors which are nebulous to define but economic and social inequity has been demonstrated to consistently affect health. [8] Working conditions impact health both directly through arduous conditions at work and also through indirect economic impacts which decide the healthcare access, education and thereby cause inequality in health. [9] The current study also evaluated social determinants of health to evaluate other associated confounding factors affecting health apart from the major morbidity in construction workers which are musculoskeletal disorders. The largest variations in means were obtained on the domains of job security, availability of safe food and drinking water and community support, basic amenities lacking in countries such as India which if addressed can lead to a large reduction of the burden of disease among this group.

## 5. Conclusion

Musculoskeletal disorders represent a large burden of disease among construction workers and cause significant impairment in physical and mental health along with limitation in daily activities. Social determinants such as lack of job security, basic amenities such as adequate nutrition, safe drinking water and community support if provided can ameliorate and assuage the impact of this condition in construction workers.

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