



Prevalence Of Work-Related Musculoskeletal Disorders Among Construction Workers

¹Rishab Chakraborty, ²Resham Saha, ³Jagannath Ghosh, ⁴Pratiti Ghosh and ^{*5}Prasun Haldar

¹Department of Physiology, West Bengal State University, Barasat, W.B., India.

²Department of Physiology, West Bengal State University, Barasat, W.B., India.

³Assistant Professor, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, W.B., India.

⁴Professor and Head, Department of Physiology, West Bengal State University, Barasat, W.B., India.

^{*5}Assistant Professor, Department of Medical Laboratory Technology, Supreme Institute of Management and Technology, W.B., India.

*Corresponding e-mail: ssprasun0@gmail.com

Article History	Abstract
Received: 28 September 2023 Revised: 21 October 2023 Accepted: 02 November 2023	<p>Background: Construction workers frequently have work-related musculoskeletal disorders (WRMSDs) with significant adverse health and financial effects. The aim of this study is to look at the reasons, effects, and prevention measures for WRMSDs among construction workers.</p> <p>Methods: In the study, one hundred thirty-six male construction workers between the ages of 30 and 56 participated. The postural stress experienced by the construction workers was assessed using a modified Nordic musculoskeletal questionnaire. The Body Part Discomfort (BPD) scale was used to assess the severity of the discomfort/pain in various body areas.</p> <p>Results: Discomfort or pain in neck portion was found to be maximum percentage of workers. BPD scaling revealed that neck, lower back and shoulder are among three most susceptible body parts in relation to pain sensation.</p> <p>Conclusion: Manual construction workers in the construction industry are particularly vulnerable to developing work-related musculoskeletal disorders (WRMSDs), working hours and MSD symptoms, particularly in the lower limb, are significantly correlated.</p> <p>Keywords: Musculoskeletal disorders, Manual construction workers, pain, BPD scoring, Postural stress.</p>
CC License CC-BY-NC-SA 4.0	

1. Introduction:

The term "work-related musculoskeletal disorders" (WRMSDs) refers to a group of conditions that affect the body's muscles, joints, tendons, ligaments, and other soft tissues. WRMSDs are brought on by occupational activity. These discomforts are frequently linked to repeated movements, awkward positioning, aggressive exertions, and other physical strains encountered at work. WRMSDs can affect the back, neck, shoulders, arms, wrists, hands, hips, and legs, among other areas (Antwi et al., 2023).

There are many causes of Work-related musculoskeletal disorders, such as: Repetitive Movements, Unusual Postures, Forceful Exertions, Vibration Exposure, Manual Material Handling, Static Positions (Kee, 2023). Work-related musculoskeletal disorders have a wide range of impacts,

they are mainly: Pain and Discomfort, Increased Absenteeism, Healthcare Costs, Emotional and Psychological Impact (Roy, 2022).

Significance of studying WRMSDs in construction workers are, Occupational Health and Safety: Physically levying construction work frequently involves heavy lifting, awkward positions, and vibration exposure, all of which raise the risk of WRMSDs (Palikhe et al., 2022). Worker Health and Quality of Life: WRMSDs can have a negative effect on a construction worker's physical well-being and standard of life by causing constant pain, anxiety, and functional limitations (Afshari et al., 2022). Worker Health and Quality of Life: Construction workers, managers, and the community at large must consider the significant financial consequences of WRMSDs (Kwon et al., 2022). Legal and Regulatory Compliance: Health and safety laws are enforced by governments and regulatory agencies in the construction industry (Gajbhiye et al., 2022). Prevention and Risk Management: The particular risk factors and causes of WRMSDs in the construction sector can be determined by studying them (Frimpong et al., 2022). Industry Improvement and Best Practices: The industry's knowledge and best practices are accumulated through studies investigating WRMSDs in construction workers (Chan et al., 2022).

It is essential to research WRMSDs in the construction industry to improve safety and health at work, promote worker well-being, reduce financial burdens, ensure regulatory compliance, and advance prevention and risk management tactics. The construction sector can improve levels of efficiency and productivity, create safer working conditions, and safeguard the health of its workforce by addressing these disorders (Bispo et al., 2022).

There are many objectives of this project such as, to investigate the kinds and incidence of WRMSDs in construction workers and to understand the different WRMSDs which impact construction workers, their incidence rates, and the particular body areas that are frequently affected.

2. Methodology:

Subjects: One hundred thirty-six male construction workers were taken randomly as subjects from few different construction sites of Belgharia, Barrackpore, Naihati and Kalyani in West Bengal. According to their level of experience working in the construction industry, the subjects were split into two groups: Group I included individuals aged 20 to 40 and Group II included individuals aged 40 to 60.

Daily work schedule: The construction workers we surveyed worked mainly in two shifts. One shift was early in the morning and the other was in the noon.

Anthropometric parameters: A Martin anthropometer and an electronic weighing device were used, respectively, to determine the subjects' height and weight. All subjects' body mass indexes (BMIs) were computed using the formula below:

$$\text{BMI} = \text{Weight in Kg} / \text{Height in m}^2$$

Questionnaire Study: A modified Nordic musculoskeletal questionnaire was applied to evaluate the postural stress of the construction workers.

Subjective rating of discomfort: The Body Part Discomfort (BPD) scale was used to assess the severity of the discomfort/pain in various body areas. This scale is indicated with the numbers "1" through "10," with "1" standing for "noticeable discomfort" and "10" for "intolerable discomfort." '0' on the scale denotes no discomfort at all.

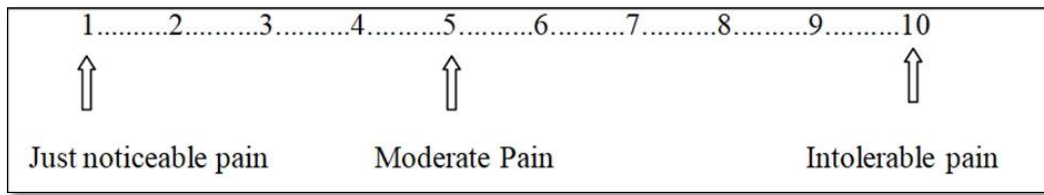


Figure 1: BPD Scale

Statistical analysis: The data was shown as mean + standard deviation. The chi-square test was used to assess the relationship between years of work experience and discomfort in various body areas. The threshold for statistical significance was set at $p < 0.05$.

3. Results:

Table: 1: Anthropometric parameters of the construction workers (N=136)

Parameters	Group A	Group B	t value	p value	Remarks (p<0.05)
Age	35+4.24	53+11.31	-17.49	0.0001	S
Height (cm)	167+4.62	164.5+0.71	1.8	0.35	NS
Weight (kg)	61.5+2.12	66.5+2.12	-0.11	0.0001	S
Body Mass Index (kg/m ²)	22.05+0.76	24.57+0.57	-2.4	0.47	NS
Working hours	2.82+1.41	2.82+0.70	0.48	0.48	NS

Anthropometric parameters of the construction workers (A= less than 40 years old) who were participated in this project as Age (years) 35+4.24, Weight (kg) 61.5+2.12, Height (cm) 167+4.62 and BMI 22.05+0.76 (Table 1). Anthropometric parameters of construction workers (B=more than 40 years old) who were participated in this project as Age (years) 53+11.31, Weight (kg) 66.5+2.12, Height (cm) 164.5+0.71 and BMI 24.57+0.57 (Table 1).

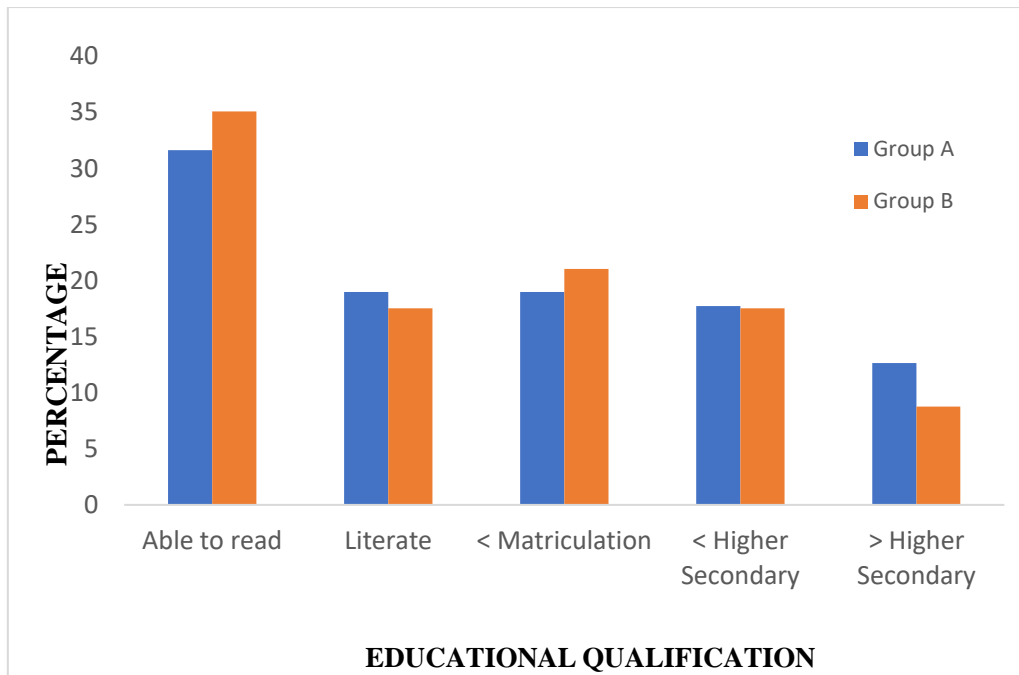


Figure 2: Education level of construction workers

The bar graph shows 31.65% of Group I workers and 35.08% of Group II workers are able to read, 12.65% of Group I and approximately 9% of Group II workers have their higher educational level.

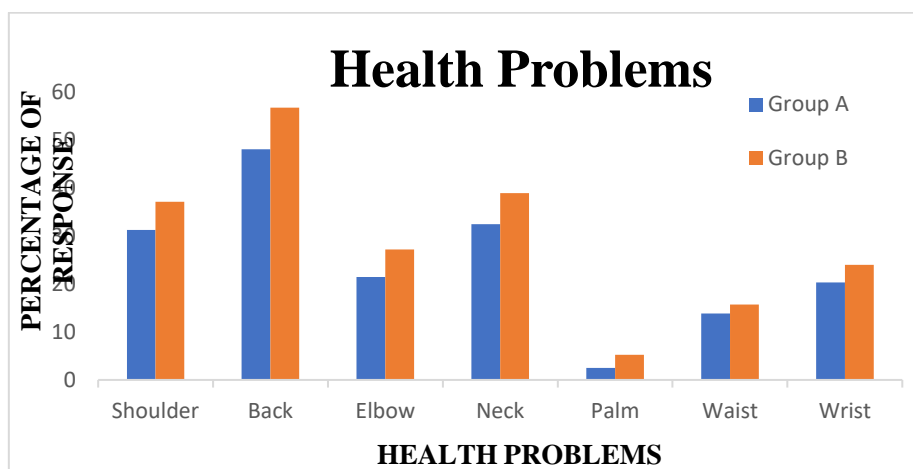


Figure 3: Assessment of Discomfort Level of Construction Workers during Last 7 days

The figure represents the acute pain or discomfort level between the two groups of construction workers in their various body parts viz., upper and lower back, neck, shoulders, elbows, wrists, hips during the past seven days.

According to the figure, 31.34% of Group I and 37.2% of Group II workers are suffering from shoulder pain, 48.18% of Group I workers and 56.84% of Group II workers are suffering from back pain, 21.46% of Group I and 27.21% of Group II workers are suffering from elbow pain, 32.53% of Group I workers and 39.02% of Group II workers are suffering from neck pain.

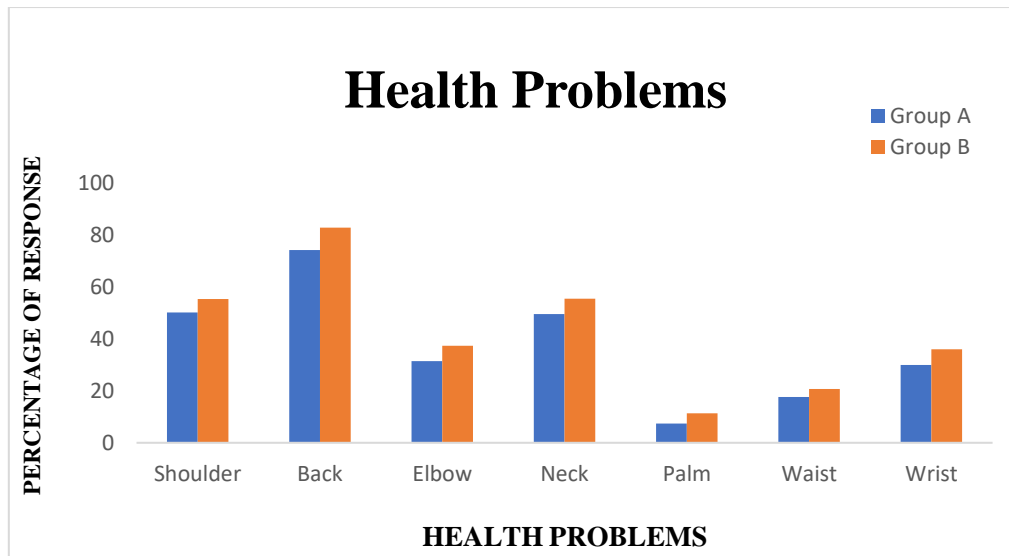


Figure 4: Assessment of Discomfort Level of Construction Workers during Last 12 months

According to the represented result the both group, musculoskeletal diseases caused by their jobs are a problem for construction workers and the most affected organs are back, shoulder, neck, elbow but the Group II workers are more prone to these problems than Group I workers. 50.14% of Group I workers and 55.29% of Group II workers are suffering from shoulder pain, 74.15% of Group I workers and 82.81% of Group II workers are suffering from back pain, 49.47% of group I and 55.42% of Group II workers are suffering from neck pain.

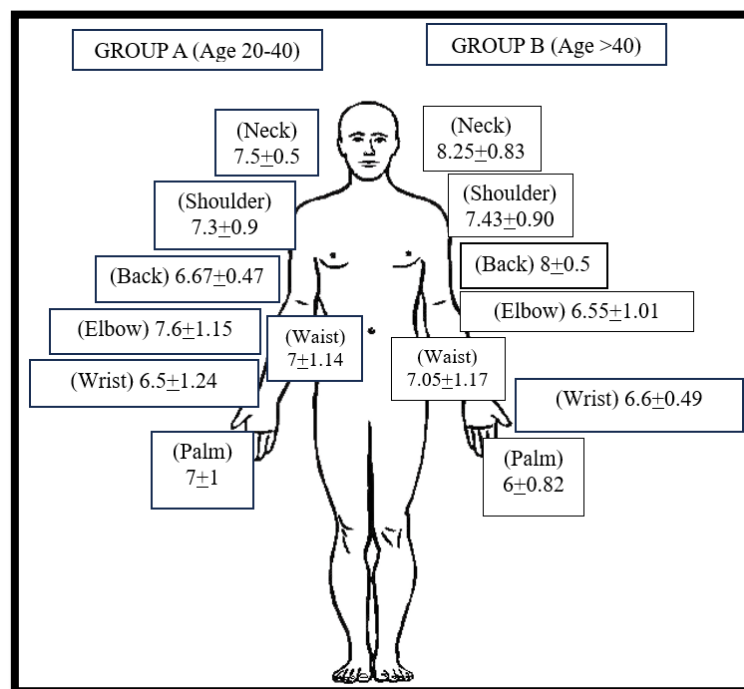


Figure 5: Body Parts Discomfort Assessment

According to the figure both group of workers body parts are badly affected by pain or discomfort but the proneness of discomfort are higher for the Group II workers.

4. Discussion:

According to the survey done on the construction site, musculoskeletal disorders are something that the majority of manual construction workers are dealing with. According to a survey from India, musculoskeletal complaints have been reported by 77% of manual construction workers over the past 12 months. Workplace hazards for musculoskeletal problems include repetitive tasks, inappropriate posture, physically demanding jobs, and vibration. The most frequent MSD reported by respondents (66.7%) is definitely musculoskeletal issues with the elbow, wrist, hand, and ankles or feet. Manual construction jobs need a lot of grasping uncomfortable posture, heavy lifting, constant bending, kneeling, and repetitive motion with the hands and feet. The shoulder region has the lowest MSD prevalence. The upper back of workers engaged in plastering tasks is in discomfort, and the lower back of workers engaged in static labor is in severe pain. According to this survey, musculoskeletal problems are most frequently reported in the upper body. Plastering tasks typically require the use of numerous body parts, as evidenced by the need to grasp tools with both hands, adopt awkward positions when applying wet mortar, lift heavy loads of wet mortar onto work platforms, frequently bend and kneel, and perform repetitive motions close to the working area. Extended labor hours in these challenging situations may also contribute to MSD issues. In this study, it was discovered that there were strong correlations between the number of hours worked and the symptoms of MSDs in the ankles or feet among construction workers. The prevalence of MSDs does not differ statistically significantly by age group. According to the study, excessive physical workload had a bigger impact on MSD symptoms than low physical workload. Thus, it can be said that there are indications of an association between MSD symptoms that affect the ankle or feet and the amount of time worked. In addition to this circumstance, the majority of the tasks required standing for a longer period of time than usual. Manual construction workers in this field typically put in between 10 and 12 hours a day. As a result, the prevalence of MSD symptoms increases significantly with employment time.

5. Conclusion:

It is concluded that MSD discomfort was moderately widespread among construction workers, with the lower back and neck being the most common sites. Among construction workers, a higher chance of moderate or severe upper body musculoskeletal pain was linked to both work-organizational and personal characteristics. The severity of MSD pain was affected by a number of variables, including working hours and employment experience. It should pay close attention to some determining elements, such as working hours, posture, and job stress, which may aid in preventing and controlling the discomfort from MSDs. Workers and occupational health service providers need both be well aware of it in order to limit and control MSDs. Several control techniques, including written ergonomics programs, management oversight, ergonomic planning considerations, training, and education, should be implemented to enhance ergonomics effectiveness in the workplace, according to the findings. At these construction sites, control measures can be implemented including training and education, workstation reorganization, the addition of mechanical aids, and the provision of personal protective equipment (PPE) for manual construction workers. In addition, changing the workstation can reduce the chance of musculoskeletal issues. This can be done by including short breaks or changes in position in the task to prevent static work circumstances, by minimizing hard edges where hands encounter tools, and by arranging the work system to reduce muscular stress. The management can also offer PPE like a back support belt and mechanical aids like a wheel barrow. Applying ergonomic concepts and techniques to improve the working environment and work procedures is a key component of WRMSD prevention and management. Important preventive steps include ergonomic assessments, Training and Education, Worksite Modifications, Job Rotation and Breaks, Personal Protective Equipment (PPE) and Health Promotion and Wellness Initiatives. Employers can improve the general health and productivity

of their workforce, minimize the rate of WRMSDs, and establish safer work environments by tackling the causes of WRMSDs and putting preventive measures in place (Kashif et al., 2022; Van et al., 2022).

Acknowledgement:

I sincerely thank all the construction workers for their co-operation as without which I might not have been able to complete this project.

References:

- Abdullahi, U. Method Of Preventing Work-Related Musculoskeletal Disorders Among Workers In Some Nigerian Construction Industry (Sokoto, Niger, Kebbi And Kogi States).
- Adedoyin, A. R., Mbada, C. E., Ajayi, O. K., Idowu, O. A., Oghumu, S. N., Oke, K. I., ... & Fatoye, F. (2022). Prevalence and pattern of work-related musculoskeletal disorders among Nigerian bricklayers. *Work*, (Preprint), 1-9.
- Afshari, D., Poureifan, P., & Nourollahi-darabad, M. (2022). Occupational and demographics predictors of musculoskeletal disorders and pain disabilities in construction workers. *Occupational Medicine*.
- Antwi-Afari, M. F., Li, H., Chan, A. H. S., Seo, J., Anwer, S., Mi, H. Y., ... & Wong, A. Y. L. (2023). A science mapping-based review of work-related musculoskeletal disorders among construction workers. *Journal of Safety Research*.
- Bispo, L. G. M., Moreno, C. F., de Oliveira Silva, G. H., de Albuquerque, N. L. B., & da Silva, J. M. N. (2022). Risk factors for work-related musculoskeletal disorders: A study in the inner regions of Alagoas and Bahia. *Safety Science*, 153, 105804.
- Chan, V. C., Ross, G. B., Clouthier, A. L., Fischer, S. L., & Graham, R. B. (2022). The role of machine learning in the primary prevention of work-related musculoskeletal disorders: A scoping review. *Applied Ergonomics*, 98, 103574.
- Frimpong, S., Antwi, A. B., Sunindijo, R. Y., Wang, C. C., Ampratwum, G., Dansoh, A., ... & Mensah, P. A. (2022). Health status of young construction workers in the Global South: The case of Ghana. *Safety science*, 148, 105673.
- Gajbhiye, M. T., Banerjee, D., & Nandi, S. (2022). Causes, Symptoms and Effect of Physical Risk Factors for the Development of Work-Related Musculoskeletal Disorders (WRMSD) Among Manual Construction Workers and Labourers in India and Intervention Through Ergonomics—A Case Study of Individual House Construction. In *Productivity with Health, Safety, and Environment: Select Proceedings of HWWE 2019* (pp. 149-160). Singapore: Springer Nature Singapore.
- Hong, X., & Lee, Y. (2022, August). Prevalence of Musculoskeletal Symptoms Among Construction Workers. In *Man-Machine-Environment System Engineering: Proceedings of the 22nd International Conference on MMESE* (pp. 140-145). Singapore: Springer Nature Singapore.
- Kashif, M., Albalwi, A., Raqib, A., Farooq, M., Ullah, R., Sakoor, M., & Kamran, Z. (2022). Work-related musculoskeletal disorders among Pakistani construction workers: Prevalence, characteristics, and associated risk factors. *Work*, 72(1), 119-126.
- Kee, D. (2023). Characteristics of Work-Related Musculoskeletal Disorders in Korea. *International Journal of Environmental Research and Public Health*, 20(2), 1024.
- Kumar, A., Indher, H. K. B., Gul, A., & Nawaz, R. (2022). Analysis of Risk Factors for Work-related Musculoskeletal Disorders: A Survey Research. *International Journal of Engineering and Manufacturing (IJEM)*, 12(6), 1-13.
- Kwon, Y. J., Kim, D. H., Son, B. C., Choi, K. H., Kwak, S., & Kim, T. (2022). A Work-Related Musculoskeletal Disorders (WMSDs) Risk-Assessment System Using a Single-View Pose Estimation Model. *International Journal of Environmental Research and Public Health*, 19(16), 9803.
- Larinier, N., Vuillerme, N., & Balaguier, R. (2023). Effectiveness of warm-up interventions on work-related musculoskeletal disorders, physical and psychosocial functions among workers: a systematic review. *BMJ open*, 13(5), e056560.

- Liang, J., Jia, N., Zhang, F., Ling, R., Liu, Y., Li, G., ... & Wang, Z. (2022). Shoulder work-related musculoskeletal disorders and related factors of workers in 15 industries of China: a cross-sectional study. *BMC Musculoskeletal Disorders*, 23(1), 1-15.
- Mbada, C. E., Abegunrin, A. F., Egwu, M. O., Fatoye, C. T., Moda, H., Falade, O., & Fatoye, F. (2022). Prevalence, pattern and risk factors for work-related musculoskeletal disorders among Nigerian plumbers. *Plos one*, 17(10), e0273956.
- Mustapha, Z., Akomah, B. B., & Baiden, J. (2022). Impact of Work-Related Musculoskeletal Disorders Among Construction Workers in Ghana. *Baltic Journal of Real Estate Economics and Construction Management*, 10(1), 129-139.
- Palikhe, S., Lee, J. Y., Kim, B., Yirong, M., & Lee, D. E. (2022). Ergonomic Risk Assessment of Aluminum Form Workers' Musculoskeletal Disorder at Construction Workstations Using Simulation. *Sustainability*, 14(7), 4356.