



HEALTH RISKS AND PREVENTION OF MUSCULOSKELETAL DISORDERS AMONG WORKERS IN THE CONSTRUCTION SECTOR

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ABSTRACT

Introduction: The increase in the number of MSD cases in the construction industry is due to repetitive bending of the back, lifting and pushing/pulling with the arms, with lifting often being from a height lower than the knee to a height higher than the shoulders.

Materials and methods. This study involved 524 construction workers and the collected data were using a structured sociological questionnaire designed to assess the risk of musculoskeletal disorders. The collected data were analyzed using both descriptive and analytical statistical methods.

Results. The majority of workers report significant physical strain at work, with 97.71% experiencing heavy exertion. Most also suffer from occasional musculoskeletal issues, such as neck and shoulder pain (91.6%), lower back pain (80.34%), and joint pain (80.34%). Constant discomfort is less common but still present. Numbness and tingling in limbs are reported by 64.27% of participants occasionally, with 3.63% experiencing it constantly. Standing in the same position for long periods is common, with roughly equal proportions working under 2 hours (42.37%) or frequently changing positions (42.2%). Only 15.46% stay in one position for over 2 hours. Frequent heavy lifting affects 93.13% of workers, while 85.69% report permanent muscle or joint injuries.

Conclusion. In order to reduce these risks associated with construction workers, it is necessary to implement adequate organizational and technical measures aimed at limiting both the frequency and duration of physical exertion.

Keywords: Construction Workers, Musculoskeletal Disorders, Occupational Hazards, Prevention,

INTRODUCTION

The construction industry remains one of the most hazardous sectors globally. According to the International Labour Organization, approximately 60,000 fatal accidents occur annually on construction sites worldwide. [1, 2] Key adverse factors affecting construction workers include high noise and vibration levels, airborne dust and chemical vapors, extreme microclimatic conditions, and high physical work intensity. [3] These hazards contribute to a wide range of occupational diseases like pulmonary diseases, diabetes, cardiovascular diseases, musculoskeletal disorders, cancer, etc.

Construction workers are exposed to OSH hazards on a daily basis during their work. As the construction industry becomes increasingly industrialized, the wide range of tasks exposes workers to adverse ergonomic problems. Poor working habits, inappropriate ergonomic positions, long working hours with insufficient rest time, hazardous working conditions, migrant labor with limited rights and influence in the workplace, and limited access to healthcare characterize the construction industry. [4]

Most work-related musculoskeletal disorders (MSDs) develop over time. The construction industry has one of the highest rates of musculoskeletal disorders, with 75% of the health problems reported by construction workers being musculoskeletal. Construction workers mostly reported complaints in their back and in lower extremities, and they have a reduced ability to perform tasks, and in the most serious cases, they could even become permanently disabled. [5, 6] Inappropriate or repetitive work tasks often result in musculoskeletal disorders such as lower back pain, shoulder tendinitis, and carpal tunnel syndrome. The growing incidence of MSDs among construction workers is likely related to repetitive trunk flexion, manual lifting, and overhead or below-knee work, especially when lifting from ground level to above-shoulder height. [7]

There is usually no single cause of MSDs; various risk factors often work in combination, including physical and biomechanical factors, organizational and psychosocial factors, and individual factors. In general, all psychosocial and organizational factors (especially when combined with physical risks) that may lead to stress, fatigue, anxiety or other reactions, which in turn raise the risk of MSDs. [8] Individual risk factors may include: prior medical history, physical capacity, lifestyle and habits (e.g. smoking, lack of exercise). These factors are associated with many diseases among workers.

An unsuitable work task can lead to the development of musculoskeletal (MSD) disorders, such as lower back pain, shoulder pain, carpal tunnel syndrome, and others. [9] Uncomfortable positions, lifting heavy materials, manual handling of heavy and unevenly sized loads, frequent bending, twisting, working above shoulder height, working below knee height, prolonged standing, climbing and descending, and pushing and pulling loads are common tasks in construction. [10] Compare the frequency of risk factors for MSDs, attitudes toward MSDs, their occurrence, treatment, and prevention, the frequency of MSDs diagnosed by a doctor, and the level of awareness and prevention of proven risk factors for MSDs among construction workers. [11] The increase in the number of MSD cases is probably due to repetitive bending of the back, lifting and pushing/pulling with the arms, with lifting often being from a height lower than the knee to a height higher than the shoulders. [12]

MATERIALS AND METHODS

The study examined 524 male construction workers, averaging 46.35 SD 8.66 years of age and 26.1 years of service. Most participants reported 5–10 years of experience, with smaller groups having over 10 or under 5 years. Data were collected using a structured questionnaire covering demographics, working conditions and exposures, lifestyle habits, self-reported health with emphasis on musculoskeletal symptoms, and perceived risks and preventive practices. Questions were mainly closed-ended to support standardized, quantitative analysis, and were administered individually under consistent conditions. Objective measures included blood pressure, lipid profile, and fasting glucose obtained from routine occupational health exams. Statistical analysis combined descriptive measures with inferential tests such as t-tests, ANOVA, and correlation analysis to explore relationships between exposures and health outcomes, with significance set at $p < 0.05$. Data processing was performed using appropriate statistical software for accuracy and consistency.

RESULTS

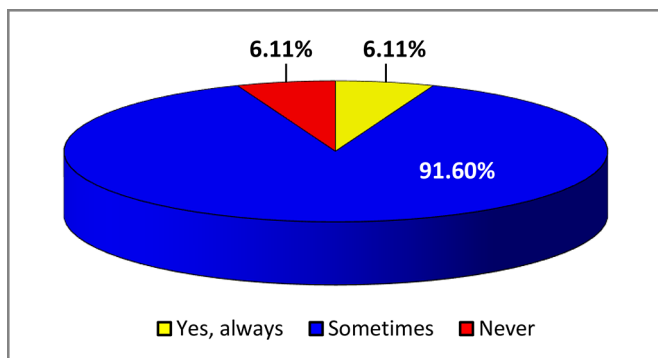
The results concerning workers' subjective perceptions of physical workload and musculoskeletal discomfort are presented in Figures 1–3. As illustrated in Fig. 1, an overwhelming majority of participants (97.71%) reported that their work involves heavy physical exertion. Only a very small proportion of respondents (2.29%) indicated that their occupational tasks do not require substantial physical effort. This finding suggests that the studied population is predominantly engaged in physically demanding work activities, which may place considerable strain on the musculoskeletal system and potentially increase the risk of work-related health problems.

In addition to the perceived level of physical workload, respondents were asked to report the frequency of musculoskeletal discomfort in the upper body, specifically in the neck and shoulder regions. The results show that the largest share of participants indicated that they sometimes experience pain or discomfort in these areas. This pattern suggests that intermittent musculoskeletal symptoms are common among workers in the sample and may be associated with repetitive movements, sustained postures, or high physical demands during work tasks.

A smaller proportion of respondents (6.11%) reported that they had never experienced pain in the neck and shoulders related to their work activities. In contrast, 2.29% of participants indicated that they experience constant pain or persistent discomfort in these regions. Although this percentage is relatively low, the presence of continuous symptoms among some workers may reflect more severe or chronic musculoskeletal conditions that could negatively affect work performance, productivity, and overall quality of life.

Overall, the findings presented in Fig. 1 highlight the widespread perception of heavy physical workload among the surveyed workers, accompanied by a notable occurrence of musculoskeletal complaints in the upper body. These results emphasize the potential occupational health implications of physically demanding work and suggest the importance of preventive measures, ergonomic improvements, and regular monitoring of workers' musculoskeletal health.

Fig. 1. Workers with pain in their neck and shoulders.



Only 15.84% of the study participants have never experienced joint pain, while 80.34% say they sometimes do. 3.82% of those surveyed experience constant joint pain. A sensation of numbness and tingling in the limbs is constantly experienced by 3.63% of participants, while 32.1% of them claim that they have never had such a sensation. The proportion of respondents who claim that they sometimes experience numbness and tingling in their limbs is 64.27%.

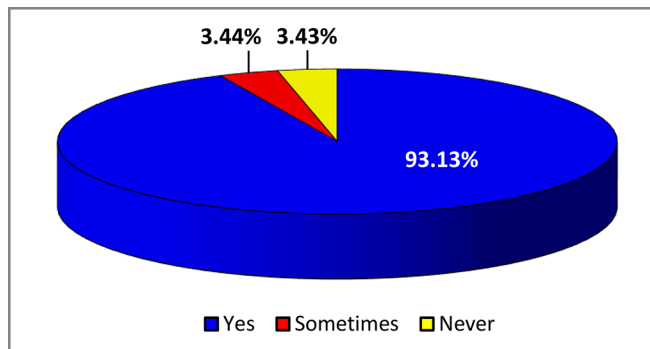
The duration of standing in the same working position among the study participants varies. It is noteworthy that the proportion of participants who remained in the same working position for less than 2 hours and those who frequently changed their position was approximately the same – 42.37% and 42.2%, respectively. Data concerning lower back pain are illustrated in Fig. 2. The findings indicate that lower back pain is highly prevalent among the surveyed construction workers. The majority of participants (80.34%) reported that they sometimes experience lower back pain, suggesting a recurrent but not constant nature of symptoms, likely associated with periodic exposure to physical strain and workload fluctuations.

In contrast, 16.42% of respondents stated that they have never experienced lower back pain, representing a relatively small subgroup with no reported musculoskeletal complaints in this region. At the same time, an equal proportion of participants (16.42%) reported constant lower back pain, which is indicative of chronic musculoskeletal conditions and may reflect prolonged exposure to ergonomic risk factors such as heavy lifting, awkward postures, and repetitive movements.

Overall, the distribution of responses highlights a substantial burden of lower back pain within the study population, with a notable proportion of workers experiencing persistent symptoms that may have significant im-

plications for work ability, productivity, and quality of life (Fig. 2).

Fig. 2. Frequency of heavy lifting among workers.

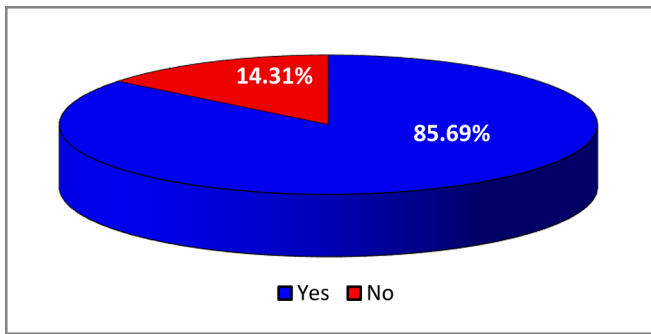


Exposure to occupational risk factors associated with machinery use and work-related injuries is illustrated in Fig. 3. The results indicate that the majority of respondents (73.09%) reported that they do not work with heavy machinery as part of their occupational duties. A smaller proportion of participants indicated varying levels of exposure: 7.64% reported frequently operating or working with heavy machinery, while 7.44% stated that they do so occasionally. Additionally, 11.83% of respondents reported regular involvement with heavy machinery, suggesting that a notable minority of the study population is routinely exposed to potential mechanical hazards in the workplace.

In addition to machinery-related exposure, participants were asked about the occurrence of permanent musculoskeletal injuries resulting from their work activities. The findings reveal that a substantial majority of respondents (85.69%) reported having experienced permanent injuries affecting their muscles or joints due to work-related factors. In contrast, 14.31% of participants indicated that they had not suffered such injuries. These results highlight a high prevalence of long-term musculoskeletal consequences among the surveyed population, underscoring the potential impact of occupational demands and physical strain on workers' health.

Overall, the data presented in Fig. 3 suggest that although most respondents are not directly engaged in operating heavy machinery, a considerable proportion still report permanent musculoskeletal injuries related to their occupational activities. This may indicate that other work-related factors—such as repetitive movements, prolonged physical exertion, or inadequate ergonomic conditions—also contribute significantly to the development of long-term musculoskeletal damage.

Fig. 3. Frequency of suffered permanent injuries to muscles or joints as a result of work.



It is striking that no participants gave a definite positive or negative answer to the question about working in extremely low or extremely high temperatures. Employees who sometimes work in an overheated or overcooled microclimate account for 87.02%, while 12.98% claim that the microclimate at their workplace is often unfavorable—with very high or very low temperatures, respectively.

A strong association was observed between occupational heavy lifting and musculoskeletal discomfort, with 92.6 % of participants who reported occasionally experiencing neck and shoulder pain also indicating that they frequently lift heavy objects as part of their work. A high proportion of participants who reported frequently lifting heavy objects also reported suffering from chronic musculoskeletal pain, with 90.3% indicating the presence of chronic musculoskeletal symptoms.

The data for a 2-year period from annual health analyzes show that, in 2023, the most common group of diseases among sick leaves among workers, by frequency, was diseases of the respiratory system - 30.37% of all sick leaves, followed by musculoskeletal disorders - 22.51%. The most common musculoskeletal disorders are: Intervertebral disc injuries in the lumbar and other parts of the spine with radiculopathy are 30.23%, lumbosacral plexus injuries are 19.77% and cervical intervertebral disc damage with radiculopathy - 9.3%. The distribution of sick leave duration for 2023 shows that the most extended duration is for musculoskeletal disorders (1281 days), followed by some infectious and parasitic diseases (1059 days), and, after that, respiratory system diseases (1041 days).

In 2024, 246 workers were absent from work due to illness. There were 398 primary sick notes with a total of 5120 days of work loss. As leading groups for employees' absence, in order of frequency (number of cases on

primary sick notes), the illness groups are ranked as follows: Respiratory diseases - 37.69%, Diseases of the musculoskeletal system and connective tissue - 16.58%, Certain infectious and parasitic diseases - 14.32%. In order of severity (number of days lost from work), the groups of diseases are as follows: Diseases of the musculoskeletal system and connective tissue - 1222 days, Diseases of the respiratory system - 1085 days, Diseases of the organs of circulation - 607 days.

DISCUSSION

Subjective questionnaire data indicate that construction workers face many health risks, which align with objective data showing high levels of MSDs. Many studies for occupational hazards among construction workers held in different countries confirm our results [1, 3, 6, 8, 10, 13]. There is no survey which received different data. The insufficient ergonomic training, inadequate use of Personal Protective Equipment (PPE) and repetitive movements are primary contributors to MSDs, which are common in our study and in the literature. It is recommended to introduce appropriate work and rest regimes—in terms of duration, type, and location, work clothing, and personal protective equipment appropriate to the microclimate of the workplace, as well as regular preventive medical examinations of workers for the purpose of prevention and early detection of musculoskeletal disorders.

CONCLUSION

The results of the study show that there are a bunch of risk factors for MSDs among workers. A lot of workers have some kind of MSD. Prolonged and frequent bending and stooping, lifting weights with the arms below hip level and above shoulder height, an excessively cold microclimate, as well as intensive and prolonged manual work with heavy loads, which accompany the daily activities of the respondents, are significant risk factors for the occurrence of musculoskeletal disorders among them. Because of the high levels of MSDs, it is necessary to organize many interventions, including a review of existing training programs to include participatory ergonomic practices in accordance with the occupational safety and health framework. Also, it is important to use Personal Protective Equipment and to explore innovative solutions such as wearable technology, which could significantly improve injury prevention by identifying risky postures and promoting real-time adjustments. Monitoring the health of workers is also very important to prevent MSDs.

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