Journal of Health Directories

E-ISSN – 3048-5762

**©JHD, 2024**

**Volume 02, Issue 04, June - July 2025 pp 01 - 10**

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

# CORRELATION BETWEEN WORKING POSTURE AND CORE STRENGTH IN LABORERS WORKING IN MECHANICAL INDUSTRIES- A CROSS-SECTIONAL STUDY"

**Chaitanya Ajay Kulkarni[1], Manasi Pravin Metkar[2]**

1. Assistant Professor, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune.
2. BPT, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune.

**Corresponding Author's information:**

Manasi Metkar

Email address-metkarmanasi@gmail.com,

Phone number- +918600020601

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

**ABSTRACT**

**BACKGROUND:** Work-related musculoskeletal disorders (MSDs) are highly prevalent in manual labor sectors and significantly affect workers' health and productivity. Poor working postures, particularly in mechanical industries, are a major contributing factor to MSDs. Core strength is essential for maintaining spinal stability and preventing musculoskeletal injuries.

**OBJECTIVE:** To examine the correlation between working posture and core strength in laborers working in mechanical industries.

**MATERIALS & METHODS:** A cross-sectional study was conducted on 100 laborers aged 20–50 years employed in mechanical industries. Working posture was assessed using the Rapid Entire Body Assessment (REBA) scale, while core strength was measured using the Modified Sphygmomanometer Test (MST). Pearson correlation was used to analyze the relationship between REBA scores and MST scores.

**RESULTS:** Most participants (68%) were categorized as having a medium risk for MSDs based on REBA scores. Additionally, 62% of the subjects showed decreased core strength, with MST scores below 40 mmHg. A moderate negative correlation ($r = -0.6957$, $p < 0.00001$) was observed between REBA and MST scores, indicating that poor working posture is associated with reduced core strength.

**CONCLUSION:** Laborers in mechanical industries are at moderate risk of developing MSDs due to poor working postures, which correlate with diminished core strength. These findings emphasize the importance of ergonomic interventions and core strengthening programs to reduce MSD risk and enhance worker health and productivity.

**KEYWORDS:**

Work-related musculoskeletal disorders (MSDs), core strength, working posture, REBA scale, Modified Sphygmomanometer Test (MST).

## INTRODUCTION

Work-related musculoskeletal disorders (MSDs) are injuries affecting bodily structures including muscles, joints, tendons, ligaments, nerves, bones, or localized circulation systems, primarily triggered or worsened by job activities and the surrounding environment where those activities take place. The majority of work-related musculoskeletal disorders (MSDs) are cumulative conditions that arise from prolonged exposure to either high or low intensity loads. These factors lead to considerable illness-related absences and decreased efficiency. The primary cause of musculoskeletal disorders is improper working posture, which can lead to minor back issues or

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

even severe disabilities (1). Small-scale industries play a vital role in development in countries like India; they play an important role in employing most industrial workers. The majority of workers are suffering from musculoskeletal disorders which is the most common work- related problem in India. In small scale industries, most of the work is still carried out standing and manually hence issues of work-related musculoskeletal disorders
and injuries in different body parts are if great concern. Performing jobs in prolonged standing has contributed to numerus health effects such as work-related musculoskeletal disorders, chronic venous insufficiency, preterm birth and spontaneous abortion, and carotid atherosclerosis. Lack of knowledge about ergonomics is observed in the industry in which work
is carried out. Musculoskeletal disorders are there in the welding process where workers are working in kneeling posture and it shows that there is a need to change the body posture. Workers work under tough conditions to perform the desired task. These tough conditions normally give rise to various musculoskeletal disorders within the workers. These disorders emerge within the worker's body due to repetitive lifting, differential lifting height, ambient conditions, etc. (2).

Industrial sectors include a wide range of occupations that require different demands. Incorrect work postures can lead to discomfort and exhaustion. Working in an awkward position strains a body part and increases the risk of injury and fatigue, which can result in permanent disability and lower productivity (3). The weakening of "core" muscular network is the main reason behind work-related musculoskeletal disorders. As a result, there can be excessive pressure on the lumbar spine, reduced muscle endurance, imbalanced hip extensors back injuries, and lower extremity instability, ultimately leading to paraspinal muscle atrophy. The term "core" refers to the center of the functional kinetic chain; whether limb movement occurs or not, the core muscles act as a cohesive muscular corset to stabilize the spine and torso. Limb movement is dependent upon the core muscle, sometimes called the "powerhouse". Core weakness is the result of poor posture adaptation and prolonged inactivity, which weakens the body's central musculature, which includes the back and abdominal muscles (4). Maintaining spinal stability requires the use of trunk muscles, especially when assuming different positions and jobs. Previous research has shown that the deep superficial lumbar multifidus, transversus abdominis, and obliquus internus of healthy individuals are significantly less active when they slouch as opposed to sitting upright (5).

The prevention of MSDs among workers depends on the accurate identification of exposure to occupational risks. Different tools and methods have been developed to assess exposure risk factors for work-related MSDs such as the Rapid Entire Body Assessment (REBA) (6). A previous study on the reliability of REBA found that its raw scores had high intra-rater reliability (ICC = 0.925) and its categorial scoring had moderate inter-reliability (IRR; Fleiss kappa = 0.54) (7).

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

REBA allows analysis of the postures of upper limbs (arm, forearm, wrist), neck, trunk, and lower extremities. In addition, it discriminates the type of grip and muscle activity performed. It identifies five level of risk, from negligible to very high (8).

Given the need for an objective assessment of muscular strength within clinical settings and the limitations of commonly used methods to measure this outcome, such as Manual muscle testing (MMT) and portable dynamometry, the Modified Sphygmomanometer Test (MST) is an interesting alternative. The MST involves an aneroid sphygmomanometer, a device that is easily obtained and portable. Based on the previous study the validity of MST was found to be ($0.80 \leq r \leq 0.91$; $p < 0.001$) and the inter-rater reliabilities ($0.80 \leq ICC \leq 0.99$; $p < 0.001$) (9).

## MATERIALS AND METHODOLOGY

Ethical clearance was secured from the Institutional Ethical Committee under IEC no. DYPCPT/ISEC/60/2024, and the study was registered with the Clinical Trial Registry India (CTRI) under registration no. CTRI/2024/11/076699. Participants meeting the inclusion criteria were recruited from mechanical industries near Dr. DY Patil University, Pimpri, Pune. Informed consent was obtained prior to their enrollment. Using purposive sampling, participants were selected for the study. Their working postures were evaluated with the REBA scale, and core strength was measured using the Modified Sphygmomanometer Test.

## PROCEDURE

The study commenced by securing ethical committee approval. Subsequently, participants were selected based on predefined inclusion and exclusion criteria. Each participant provided informed consent to confirm their voluntary involvement. To assess posture, photographs were captured of participants during their typical work tasks, focusing on their predominant working posture. These images were evaluated using the Rapid Entire Body Assessment (REBA) worksheet protocol. The REBA method facilitated the identification of posture-related risks through photo analysis. Core strength was measured with the Modified Sphygmomanometer Test (MST), offering an objective assessment of muscular strength. Data from both the posture evaluation and core strength tests were analyzed to explore potential correlations between working posture and core strength. This analysis aimed to elucidate their relationship and impact on workplace musculoskeletal disorders.

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

## RESULTS AND OBSERVATION:

| REBA INTERPRETATION | REBA SCORE | n | % |
|---|---|---|---|
| NEGLIGIBLE RISK | 1 | 3 | 3 |
| LOW RISK | 2 TO 3 | 18 | 18 |
| MEDIUM RISK | 4 TO 7 | 68 | 68 |
| HIGH RISK | 8 TO 10 | 11 | 11 |

**TABLE NO. 1 REBA INTERPRETATION**

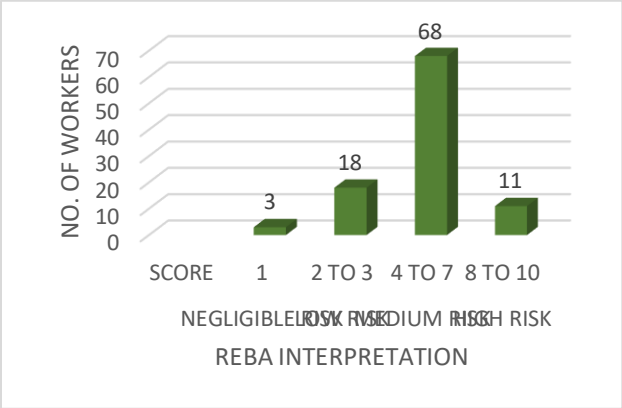


**FIGURE 1: REBA SCORE INTERPRETATION**

**Table 1 and Figure 1**: Indicate the REBA interpretation of the workers. According to the data 68% workers are at medium risk of MSDs.

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

| MST SCORE | n | % |
|---|---|---|
| Less than 40 mmHg | 62 | 62 |
| 40 mmHg and above | 38 | 38 |

**TABLE NO. 2 MST SCORES**

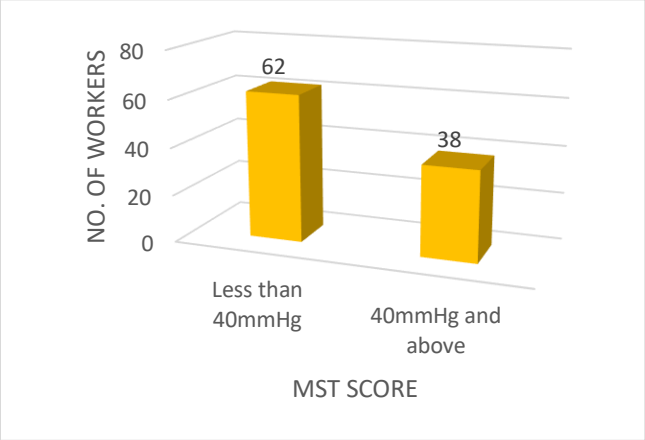


**FIGURE 2: MST SCORE**

Table 2 and Figure 2: Represents the MST scores of the workers. According to the data maximum no. of workers had decreased core strength.

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

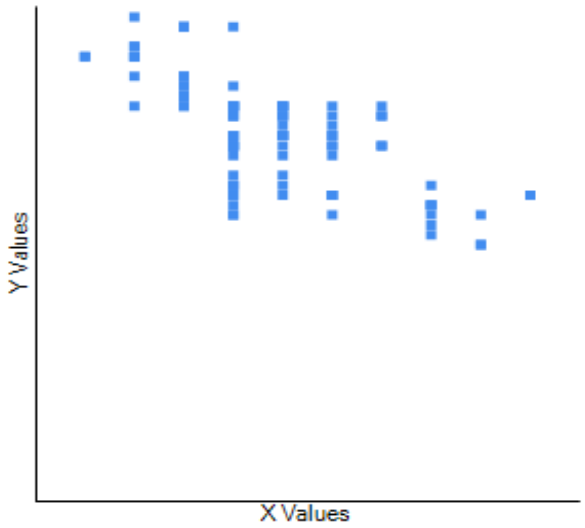


**FIGURE. 3 CORRELATION OF REBA SCORE AND MST SCORE**

**Figure 3:** Represents the Correlation of REBA score and MST score. The correlation was analyzed using the Pearson Correlation Test. The result was a moderate negative correlation, with r value -0.6957 and p-value < .00001. The result is significant at $p < .05$

## DISCUSSION

Our study investigated the relationship between working posture and core strength among laborers in mechanical industries. Conducted in industries with workers aged 20–50, it involved 100 participants, and data was gathered. Posture was evaluated using the REBA scale and scored accordingly. Core strength was measured with the Modified Sphygmomanometer Test in mmHg. Musculoskeletal disorders (MSDs) are a major global occupational health concern, particularly in manual labor-dominated small-scale industries. A prior study noted a high MSD prevalence in Indian electronics sectors, linking it to poor ergonomic setups, awkward postures, and repetitive tasks (10). Likewise, research indicated that repetitive lifting and extended standing significantly contribute to back pain, shoulder issues, and lower limb injuries in industrial workers (2). Beyond manual labor, sedentary office workers also face MSD risks due to prolonged sitting and static postures. A study found that office workers sitting for over 30 minutes continuously often experience back, neck, and shoulder discomfort. The widespread occurrence of MSDs in both active and sedentary roles highlights the critical need for ergonomic interventions (6). The core muscles, including

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

transverse abdominis, multifidus, obliques, and rectus abdominis, are vital for spinal stability and limb movement. Poor posture weakens these muscles, raising the risk of musculoskeletal injuries. The core serves as the body's "powerhouse," and its weakness can lead to issues like imbalanced hip extensors, reduced endurance, and lumbar instability (9). In this study, 72% of participants reported working over 8 hours daily, a factor linked to increased MSD risk. Prolonged sitting and slouched postures reduce deep lumbar stabilizer activation (11). Research showed that poor sitting postures cause biomechanical changes, such as decreased spinal stability and increased strain on other muscle groups, indicating a direct impact of posture on core strength and long-term musculoskeletal health (5). Participants were divided into three age groups: 52% young adults (17–30 years), 39% middle-aged adults (31–45 years), and 9% older adults (above 45 years). Age-related declines in muscle strength and flexibility, well-documented in literature, may worsen the effects of poor posture in older workers. REBA is a globally validated tool for assessing ergonomic risks in various postures, with high intra-rater reliability (ICC = 0.925) and moderate inter-rater reliability, making it effective for evaluating industrial tasks (7). Its applicability spans diverse occupations, including manual labor and office work (8). In this study, 68% of participants were in the medium-risk REBA category (scores 4–7), and 11% were in the high-risk category (scores 8–10), indicating a significant risk of MSDs due to poor posture. The Modified Sphygmomanometer Test (MST) is a cost-effective, reliable method for measuring muscle strength. A study validated MST for clinical settings, highlighting its simplicity and affordability compared to dynamometers (12). Another study emphasized MST's utility in resource-limited environments due to its portability and ease of use (9). Here, MST assessed core strength, revealing lower values in participants with poor postures, consistent with findings of core weakness in sedentary workers. The MST provided reliable data, confirming a strong link between poor posture and reduced core strength (13). In this study, 62% of participants had MST scores below 40mmHg, indicating weak core strength, while 38% scored 40mmHg or higher. Weak core strength compromises spinal stability, exacerbating poor posture and MSD risk. Prolonged poor posture leads to progressive musculoskeletal issues, affecting the spine, upper limbs, and lower extremities, increasing fatigue, reducing productivity, and risking permanent disability, especially in repetitive, demanding industrial tasks (3). Core weakness worsens these problems by reducing spinal stability and increasing stress on peripheral joints. Research confirms that core muscle endurance reduces lower back injuries, as weak core muscles fail to provide dynamic stability, leading to overuse injuries and chronic pain (4). This study underscores the need for ergonomic interventions in

Journal of Health Directories

E-ISSN – 3048-5762

©JHD, 2024

Volume 02, Issue 04, June - July 2025 pp 01 - 10

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

industrial settings. Practical measures like regular breaks, task rotation, ergonomic workstation design, and worker education can reduce risks (2). Incorporating core strengthening into workplace wellness programs can enhance musculoskeletal health and boost productivity.

## CONCLUSION

Based on the results of this study, it concludes that the maximum workers are at medium risk of musculoskeletal disorders and have decreased core strength. There was a moderate negative correlation between working posture and core strength of laborers working in mechanical industries.

## CONFLICT OF INTEREST

The authors have no conflict of interest

## FUNDING

This research did not receive any external funding.

## REFERENCES

1. Singh J, Kocher G, Lal H. MUSCULOSKELETAL DISORDER AMONG WORKERS IN SMALL SCALE FORGING INDUSTRY. Int J Appl Res Mech Eng. 2013 Jan;199–206.
2. Mechanical Department Agnihotri college of Engineering Wardha 442001, India, Ansari NA, Sheikh DrMJ. Evaluation of work Posture by RULA and REBA: A Case Study. IOSR J Mech Civ Eng. 2014;11(4):18–23.
3. Amri AN, Putra BI. Ergonomic Risk Analysis of Musculoskeletal Disorders (MSDs) Using ROSA and REBA Methods On Administrative Employees Faculty Of Science. J Appl Eng Technol Sci JAETS. 2022 Sep 2;4(1):104–10.
4. Mistry I, Rushali P, Tank P, Sonpal D, Rakholiya P, Patel R. Prevalence core muscle weakness in 18-25 years old females. 2021 Nov 19;
5. Wong AYL, Chan TPM, Chau AWM, Tung Cheung H, Kwan KCK, Lam AKH, et al. Do different sitting postures affect spinal biomechanics of asymptomatic individuals? Gait Posture. 2019 Jan 1;67:230–5.

Journal of Health Directories

E-ISSN – 3048-5762

**©JHD, 2024**

**Volume 02, Issue 04, June - July 2025 pp 01 - 10**

Received – 11 – 06 - 2025

Accepted – 20 - 07- 2025

Published – 29 - 07- 2025

6. Mohammadipour F, Pourranjbar M, Naderi S, Rafie F. Work-related Musculoskeletal Disorders in Iranian Office Workers: Prevalence and Risk Factors. J Med Life. 2018;11(4):328–33.

7. Schwartz AH, Albin TJ, Gerberich SG. Intra-rater and inter-rater reliability of the rapid entire body assessment (REBA) tool. Int J Ind Ergon. 2019 May 1;71:111–6.

8. Hita-Gutiérrez M, Gómez-Galán M, Díaz-Pérez M, Callejón-Ferre ÁJ. An Overview of REBA Method Applications in the World. Int J Environ Res Public Health. 2020 Jan;17(8):2635.

9. Brito SAF de, Santana M de M, Benfica P do A, Aguiar LT, Gomes G de C, Faria CDC de M. The modified sphygmomanometer test for assessment of muscle strength of community-dwelling older adults in clinical practice: reliability and validity. Disabil Rehabil. 2022 Jan 11;44(1):131–8.

10. Singh T, Singh J. Ergonomic Evaluation of Industrial Tasks in Indian Electronics Industries. 2012;3(7).

11. Daneshmandi H, Choobineh A, Ghaem H, Karimi M. Adverse Effects of Prolonged Sitting Behavior on the General Health of Office Workers. J Lifestyle Med. 2017 Jul;7(2):69–75.

12. Souza LAC, Martins JC, Moura JB, Teixeira-Salmela LF, Paula FVRD, Faria CDCM. Assessment of muscular strength with the modified sphygmomanometer test: what is the best method and source of outcome values? Braz J Phys Ther. 2014 Apr;18:191–200.

13.Bhore PR, Bathia K, Kanase S, Jadhav A. Prevalence of Core Weakness in Bank Employees. J Clin Diagn Res. 2019;13.