International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Estimation of Spinal Dysfunction in Construction Site Labourers

Tanisha HİWALKAR[1], Pooja JAİN[1] and Sandeep SHİNDE[*2]

[1]Department of Musculoskeletal Sciences, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth, Krishna Institute of Medical Sciences Deemed to be University, Karad, Maharashtra / India
[2]Head of Department of Musculoskeletal Sciences, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth, Krishna Institute of Medical Sciences Deemed to be University, Karad, Maharashtra / India
*Corresponding author: drsandeepshinde24@gmail.com

Abstract

Purpose: The study aimed to assess the extent of spinal dysfunction experienced by construction site workers, considering factors such as experience, posture, discomfort, range of motion, and muscle strength. **Method:** This cross-sectional study selected 107 construction workers from various sites using a simple random sample approach, which was secured in writing. The study utilized various assessment tools, including the Double Leg Lowering Test, Nordic Musculoskeletal Pain Rating Scale, and Posture assessment, to evaluate the patient's pain levels using the SPSS version 23.0. **Findings:** The study found a significant correlation (P=0.0376) between worker type and postural abnormalities. Masons had 68.4% severe lumbar lordosis, 78.9% hyperextended knees, and 86.3% prominent thoracic kyphosis. There was significant correlation (P 0.0001) between the workers' experience and results of the double leg lowering test. Furthermore, there was a significant difference (P= 0.0017) between the Visual Analogue Pain Rating Scale and work experience. As laborers become more experienced, their abdominal muscles may weaken, causing significant tension on their spines. **Conclusion:** The study concluded that construction site workers with 10+ years of experience, undergo significant spinal dysfunction due to decreased abdominal muscle strength, resulting in increased strain on their spines.

Keywords
Spinal Posture, Lumbar Core Strength, Lumbar Derangement, Lumbar Radiculopathy

INTRODUCTION

Construction is an important industry that employs an enormous number of people. Due to recent advancements and the onset of industrialization, this business is essential to the construction of roads, bridges, buildings, and other infrastructure (Tiwary & Gangopadhyay et al., 2011). India's construction industry is flourishing, which has resulted in a significant increase in the labour force. With a 10% yearly growth rate in India, it is one of the fastest expanding industries. It involves a broad range of jobs with an extensive workforce, the majority of whom are unstructured or unorganized labourers. In India, around 340 million (72%) workers are employed in the unorganized sector, with roughly half of them employed in the construction companies (Bowles & MacPhail, 2008; Mishra et al., 2012; Rajasekhar et al., 2009; Mutatkar et al., 2013). Construction work in India is divided into two categories: organized and unorganized. Majority of construction workers work in unorganized areas. Working practices in unorganized industries are considerably more rudimentary and traditional than in organized sectors. Labourers in unorganized areas are often hired on a daily wage basis by labour contractors. Before being hired, the labourers receive no training and are unaware of the ergonomic risks associated with their job (Haslam et al., 2005; Ponnuswamy et al., 2003). Among the most numerous and susceptible groups of unorganized labour in India are labourers who work in building construction. These workers are constantly under a lot of pressure to complete the eight hours of work a day on average. They may be forced to work overtime even

Received: 07 Nowember 2023 ; **Revised** ; 30 July 2024 ; **Accepted:** 20 August 2024; **Published:** 25 September 2024

How to cite this article: Hiwalkar, T., Jain, P., and Shinde, S. (2024). Estimation of Spinal Dysfunction in Construction Site Labourers. *Int J Disabil Sports Health Sci*;7(5):955-967.https://doi.org/10.33438/ijdshs.1387397

after eight hours of intense labour due to unforeseen circumstances (Sahu & Subhashis et al., 2010).

Majority of contractors refuse to take responsibility for worker injuries and other occupational health risks, and they do not pay for worker health complaints. Manual material handling is the most affordable and straightforward solution because labour costs are low in India. Lifting, loading, carrying, pushing, tugging, unloading, and delivering are all necessary for these manual material handling jobs. The physical demands of construction work are matched with ergonomic hazards due to the manual material handling and various equipment operating tasks. Indeed, heavy lifting, repetitive joint motions, forceful exertions, and awkward postures are just a few of the ergonomic risk factors that construction workers frequently encounter. As a result, many ergonomic health issues and injuries affect construction workers. The most prevalent forms of ergonomic health issues at work among construction workers are sprains and strains in various body parts, which can occasionally prevent them from working (Sahu and Subhashis et al., 2010). Risks associated with construction are eight times higher than those associated with the manufacturing sector (Telaprolu et al., 2013).

Approximately 33% of newly identified workplace injuries in the general population and 77% in the construction industry are related to musculoskeletal disorders (MSDs), which are the single largest cause of work-related illness worldwide. In addition to reducing productivity at work, musculoskeletal disorders are the main cause of disability, missed work days due to illness, and sick leave. Through both direct and indirect mechanisms, musculoskeletal disorders affect every aspect of health. The effects on the physical dimension of health, such as bodily injuries, missed workdays, and delayed healing because the injuries are repetitive, influence other dimensions of health as well, such as mental health and consequently the social and emotional dimensions. The socioeconomic status is indirectly impacted by lost wages, absenteeism from work due to illness, medical expenses, and in some cases, hospitalization of employees. Poor working conditions, inadequate training, bad posture, long workdays with little time for breaks, psychosocial factors like support from coworkers and supervisors, and other elements like job pace and monotony are some of the etiological factors contributing to the occurrence of this condition (Punnett et al. 2004). Many musculoskeletal pains and disorders can be brought on by the physical demands of construction workers' manual material handling and awkward, prolonged working postures (Telaprolu et al., 2013). On the other hand, prolonged pain perception may indicate work related musculoskeletal disorders (WRMSDs) (Silverstein et al., 2002). Injury and disease of the soft tissues, including muscles, tendons, ligaments, joints, and cartilage, that affect almost all tissues, including the nerves and tendons in the neck, shoulders, backs, arms, and legs, is known as a WRMSDs (Kusmasariand Sutalaksana et al., 2018) .Apart from the high number of deaths attributable to the nature of the work, WRMSDs are prevalent health issues among construction workers (Jinadu et al., 1987). Chronic disorders that can worsen over time comprise the majority of WRMSDs. These may also be the consequence of injuries received in an accident at work, and they may be of either episodic or chronic duration. They can also develop into more serious disorders over time, moving from mild ones. While many adult people worldwide suffer from these disorders, which are rarely fatal, they nevertheless significantly lower their quality of life (Roy et al., 2022).

WRMSDs that arise from the nature of construction work have a greater negative impact on workers' quality of life, lead to missed work or absenteeism, increase work restrictions, or result in disability than any other group of diseases, and have a significant financial cost to both individuals and society.Majority of the unskilled labour performed by women in the construction sector includes carrying and lifting large objects, scaling ladders, and other similar tasks. Women mazdoors who perform these jobs are highly susceptible to both acute and cumulative WRMSDs (Telaprolu et al., 2013). One of the biggest work-related health issues and a major contributing factor to construction workers' reduced productivity is WMSD (Sahu & Subhashiset al., 2010) .The three main risk factors linked to WRMSDs are high force levels, awkward postures, and repetitive movements (Silverstein et al., 2002). Workers in the construction industry are more likely to experience WMSDs in their upper and lower extremities as well as their back (van der Molen et al., 2004). The occupation with the highest risk of back pain at work is construction (Latza et al., 2002). In developed countries, lower back pain (LBP) is among the most common and widespread musculoskeletal disorders that lead to disability and absenteeism from work. LBP is regarded as one of the main causes of disability, financial burden, loss of quality of life, incapacity to work, and absenteeism from work (Bc et al., 2019; Harrianto et al., 2009; Jain et al., 2024; Vujcic et al., 2018). Around 60% to 90% of people will experience low back pain at some point in their lives. Numerous factors that contribute to lower back pain (LBP) are linked to employment. Approximately 37% of LBP worldwide is related to employment (Punnett et al., 2005). There are now three distinct categories of possible risk factors: (a) personal characteristics like height, age, weight, and smoking (b) physical elements like intense lifting, quick work rates, repetitive motion patterns, inadequate rest periods, contorted body positions, uncomfortable and whole-body vibration, contact stress, and extremely high or low temperatures (c) Psychosocial elements, including organizational stress, dissatisfaction with job, and psychological requirements and mental workloads (Holmström et al., 1992; Latza et al., 2000).

Construction work requires workers to adopt a variety of awkward, extreme, and repeated postures including bending, twisting, and sometimes even back extension. Performing these posture by strenuous work for an extended period of time can result in low back MSDs (Buchholz et al., 1996). Risk raises if such work involves the twisting of the trunk (Hakkanen et al., 1997). Many researchers have noted the close relationship between working postures and incidences of musculoskeletal symptoms, despite the fact that assessing spinal dysfunction in construction workers has received little attention (Armstronget et al., 1986; Armstronget et al., 1993; Corlettand Bishop et al., 1976; Sahu et al., 2010). As a result, the purpose of this study was to fill a critical knowledge gap concerning the importance of assessing the level of spinal dysfunction among construction labourers. The hypothesis of the study was to estimate spinal dysfunction in construction labourers.

MATERIALS AND METHODS

This cross-sectional study was conducted at Karad with consent from the institutional ethical committee. A total of 107 male and female construction workers, ages 25 to 45, from various construction sites in Maharashtra. They were chosen a simple random sampling approach. Computer generated SPSS software was used. Participants with a normal body mass index (BMI), or 18.5-24.9, as well as men and women who had worked as laborers on construction sites for more than ten years and 5 hours daily were included in the study. Pregnant women, those with underlying co-morbidities, and those with pre-existing spinal abnormalities were not allowed to participate. Our primary goal was to assess the degree of spinal dysfunction experienced by construction site workers and to put a number on it by taking in account several characteristics such as years of experience, posture, discomfort, range of motion, and muscle strength.

Procedure

Ethical approval (KIMSDU/IEC/01/2021) was obtained from the Institutional Ethical Committee of KIMSDU. People were contacted, and those who met the requirements for inclusion were chosen. Those who wished to participate were given written and verbal informed consent after the protocol was described. Data regarding the subjects' demographics was obtained. They were explained the study's objectives and given information on how it would be conducted. A spinal dysfunction examination was performed on each of them using the Nordic Musculoskeletal Pain Rating Scale, the Posture examination, the Double Leg Lowering Test, and the Nordic Musculoskeletal Discomfort Scale. Data was collected.

Outcome measures

Double leg lowering test.

One way to think of core stability is as the result of the lumbopelvic hip complex's muscular capability and motor control. There are numerous tests available to assess and measure trunk muscular strength. The intra-tester reliability of the double-leg-lowering (DLL) test is excellent, with values ranging from 0.93 to 0.98 (Martin et al., 1996; Rathod et al., 2021).

Range of motion of cervical, thoracic, and lumbar spine

Physical therapists employ goniometric measurements to determine appropriate treatment approaches, assess baseline restrictions of motion, and record the efficacy of these interventions. Goniometry, arguably our most popular assessment method, is an essential component of the "basic science" of physical therapy (Sahu and Subhashis et al., 2010).

Posture assessment

The two-dimensional evaluation of posture, using a plumb line, is very common, due to its low cost and simplicity. Abrams et al. (2006), postulated guidelines to evaluate posture in accordance with the alignment of ideal plumb line for the measurement of the sagittal and frontal plane.
Following positions carry a significant lifetime risk of developing spinal problems.

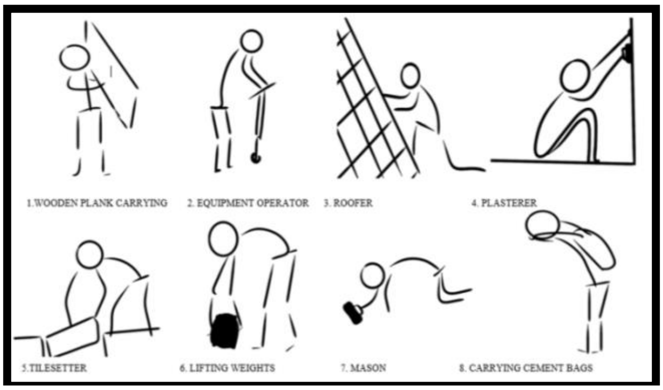

Figure 1. Postures assumed by labourers

Diagram 1 in figure 1 shows the position of a laborer holding a wooden plank. The shoulder that is being used is under a lot of loads. Additionally, there is a tendency for the spine to curve laterally, which increases the risk of scoliosis. An equipment operator is seen in Diagram 2; while he operates equipment, he slumps forward, which causes spinal dysfunction. Roofers are represented in Diagram 3. The task of a roofer entails a lot of bending, shoulder extension, and lunging. The plasterer's stance is depicted in the fourth diagram. Prolonged periods of squatting required for this job could cause low back pain. Diagram 5 shows the postural alignment of a tile setter, whose job also requires a lot of bending, which puts stress on the spine. Diagram 6 illustrates the unusual stance.

Manual muscle testing of upper limb, lower limb, and spine.

The most popular technique for recording muscle power impairments is MMT. It is the approach most frequently employed to record muscle strength impairments. When applying force against the subject's resistance, the examiner rates the subject's researched muscle groups as "strong" or "weak" on a five-point rating scale (Cuthbert et al., 2007; Shinde & Ghadage, 2022).

Visual analogue scale for pain assessment.

One of the main methods used to identify spinal dysfunction in workers is the assessment of pain intensity. Number of scales are frequently used to measure the degree of pain. In clinical practice, the NRS, VAS, and VRS are frequently employed among them. The validity and reliability of these pain-rating measures for determining pain severity have been demonstrated (Alghadir and Ahmad et al., 2018; Kulkarni & Shinde, 2020).

Nordic musculoskeletal discomfort scale.

In nine body locations, the Nordic Musculoskeletal Questionnaire (NMQ) measures musculoskeletal discomfort and activity avoidance. The NMQ consists of only three questions on the prevalence of symptoms over a year and a week, as well as an annual prevention from normal work (whether done at home or away from home) (Dawson & Anna et al., 2009).

Statıstıcal analysıs:

The outcome measures were assessed at the start of the study. The study was manually and statistically analyzed (SPSS version 23.0). When statistically analyzing the data collected, descriptive statistics such as mean, percentage, and standard deviation were utilized. ROM was used to evaluate spine mobility. MMT analyzed and calculated upper limb, lower limb, and spine strength. The double leg lowering test was used to evaluate core stability. Pain at rest and during activity was analyzed and calculated by mean and standard deviation, whereas demographic data were determined by percentage.

RESULTS

A survey consisting of 107 laborers who had worked on construction sites for over a decade was conducted. Its primary goal was to use a variety of outcome measures to quantify the spinal dysfunction among them. Our statistical investigation revealed a significant link (P=0.0376) between the type of workers and their postural anomalies, including lifters, equipment operators, Masons, roofers, and plasterers.

Table 1. The distribution of demographic characteristics in the sample

Parameter	Frequency	Percentage
Age group		
25-30	28	26.1%
31-35	20	18.6%
36-40	15	14.01%
41-45	44	41.1%
Gender		
Male	71	66.3%
Female	36	33.6%
Type of Worker		
Mason	22	20.5%
Roofer	11	10.2%
Plasterer	16	14.9%
Welder	14	13.08%
Tile Setter	5	4.6%
Equipment Operator	19	17.7%
Lifter	20	18.6%
Years of Workıng		
10-12	49	45.79%
13-15	8	7.47%
16-18	12	11.21%
19-21	27	25.23%
22-24	11	10.28%

Interpretation

Table 1 shows that 26.1% of the population was between the ages of 25 and 30, 18.6% between 31 and 35, 14.01% between 36 and 40, and 41.1% between 41 and 45. Most workers are younger than the 41–45 age range. It was also noted that men made up around 70% of the workforce, with women making up the remaining 30%. Masons made up the largest group of workers (20.5%), while tile setters made up the smallest (4.6%). 45.7% of workers had worked for ten to twelve years, 7.4% for 13 to 15 years, and 11.2% for 16 to 18 years of age. The remaining 10.28% had experience ranging from 22 to 24 years, while about 25.23% had experience spanning 19 to 21 years.

Table 2. Posture assessment

Type of worker	Cervical Spine (Exaggerated)	Shoulder (Forward)	Thoracic Spine (Exaggerated)	Lumbar Spine (Exaggerated)	Knees (Hyperextended)
Mason	15.7%	57.8%	86.3%	68.4%	78.9%
Roofer	72.7%	81%	72.7%	36.3%	72.7%
Plasterer	0%	50%	62.5%	37.5%	50%
Welder	0%	64.2%	64.2%	35.7%	7.14%
Tile setter	40%	60%	100%	80%	20%
Equipment op	15.7%	42.1%	68.4	52.6%	5.2%
Lifter	15%	75%	65%	25%	50%

Interpretation

According to table 2, 68.4% had extreme lumbar lordosis, 78.9% had hyperextended knees, and 86.3% of the masons displayed exaggerated thoracic kyphosis. In roofers, 72.7% of the cervical spine was exaggerated, 81.8% of the shoulders were hunched forward, 72.7% had an excessive thoracic kyphosis, and 72.7% had an exaggerated lumbar lordosis. 37.5% of plasterers had a lumbar lordosis that was excessive, and 62.5% of them had a thoracic kyphosis that was excessive. Only 7.14 percent of welders had excessive lumbar lordosis, while 64.2% had forward shoulders. 80% of tile setters have a pronounced lumbar lordosis. Only 5.2% of equipment operators had hyperextended knees, compared to 68.4% who had extreme thoracic kyphosis and 52.6% who had exaggerated lumbar lordosis. Lifters' knees were hyperextended in 50% of cases, and their thoracic spines were accentuated in 65% of cases.

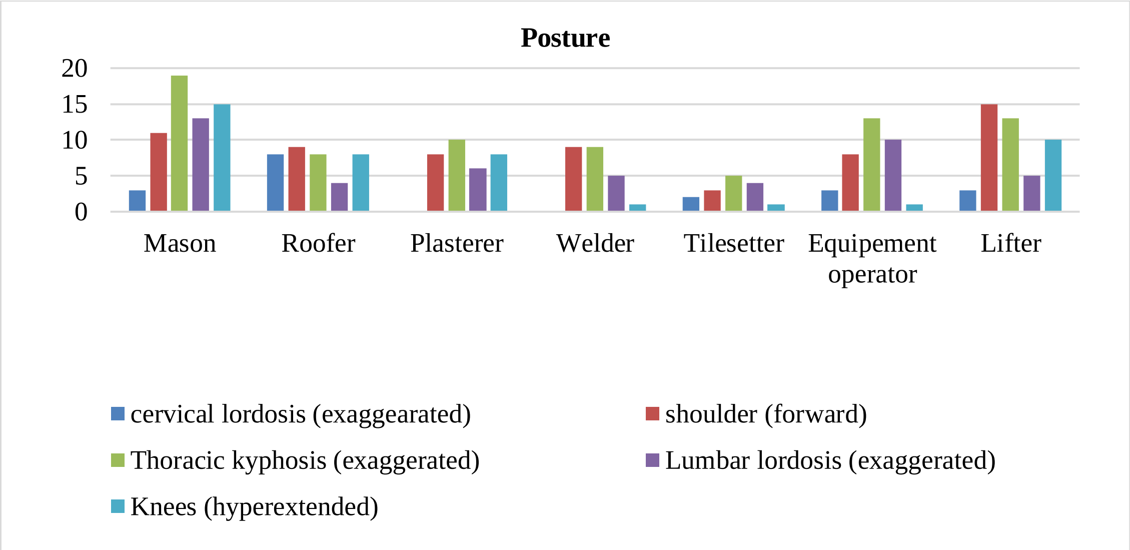

Fıgure 2. Postural abnormalities observed in workers.

Table 3. Double leg lowering test

Years of working	Normal	Good	Fair	Poor	Trace	P-Value
10-12	4%	38.9%	46.9%	10.2%	0%	0.0001
13-15	0%	0%	25%	75%	0%	
16-18	0%	0%	0%	83%	16.6%	
19-21	0%	0%	0%	92.5%	7.4%	
22-24	0%	0%	0%	72.7%	27.2%	

Interpretation

The double leg lowering test and the laborers' employment history were substantially correlated (P=0.0001) as shown in Table 3. The percentage of individuals with work experience of 10 to 12 years [49 (100%)] who performed the Double Leg Lowering Test as determined by the Manual Muscle Test Score (MMT) were found to have normal (4%), good (38.9%), fair (46.9%), bad (10.2%), and trace (0%) results. Among those with 13 to 15 years of work experience, 8 (100%) displayed fair (25%) and bad (75%) performance. Individuals with 16–18 years of job experience [12 (100%)] had poor (83.3%) and trace (16.6%). People with 19 to 21 years of work experience (n = 27; 100%) exhibited poor (92.5%) and trace (7.4%) behaviors. Individuals with 22 to 24 years of work experience [11(100%)] only demonstrated bad (72.7) and trace (27.2%) performance.

Table 4. Manal muscle testing (MMT) of spine

Type Of Worker	Cervical	Thoracic	Lumbar	P- Value
Mason	4.6±0.5	4±0.7	3.4±0.7	0.0120
Roofer	4.1±0.5	4.5±0.6	4±0.7	
Plasterer	4.1±0.5	4.6±0.6	3.7±0.7	
Welder	4.7±0.5	4±0.6	4±0.7	
Tile setter	4.8±0.5	3.2±0.7	4.2±0.7	
Equipment operator	4.7±0.5	3.8±0.7	3.9±0.7	
Lifter	4.20.5	4.6±0.6	3.8±0.7	

Interpretation

Table 4 displays the average results of manual muscle testing of the cervical, thoracic, and lumbar spine in relation to the different worker types. The difference between these two criteria is thought to be significant (P=0.0120). The median MMT values of thoracic spine of tile setters, equipment operators, and plumbers were lower than the rest, at 3.2, 3.8, and 3.6. Plasterers, equipment operators, and lifters showed somewhat lower lumbar MMT values, which are 3.7, 3.9, and 3.8, respectively. This indicates that there was more strain on their lower backs.

Table 5. Manual Muscle Testing of Limbs

Joint	Right	Left	P- Value
Shoulder Flexors	4.8±0.4	4.8±0.3	0.37
Shoulder Extensors	4.7±0.4	4.7±0.4	
Shoulder Abductors	4.8±0.3	4.8±0.3	
Shoulder Adductors	4.9±0.2	4.9±0.2	
Elbow Flexors	4.8±0.3	4.8±0.3	
Elbow Extensors	4.8±0.3	4.8±0.3	
Wrist Flexors	4.7±0.4	4.6±0.5	
Wrist Extensors	4.8±0.3	4.9±0.2	
Hip Flexors	4.9±0.2	4.9±0.2	
Hip Extensors	4.8±0.3	4.9±0.2	
Hip Abductors	4.9±0.2	4.9±0.2	
Hip Adductors	4.8±0.3	4.9±0.1	
Knee Flexors	4.7±0.4	4.8±0.3	
Knee Extensors	4.8±0.3	4.8±0.3	
Ankle Dorsiflexors	4.8±0.3	4.9±0.2	
Ankle Plantarflexors	4.9±0.2	4.9±0.2	

Interpretation

Table 5 provides the average results for Manual Muscle Testing of the upper and lower limbs. They are not regarded as being significant (P=0.37). Every muscle group showed MMT in the 4-5 range. This demonstrates that because they are active and not sedentary, their limb strength was not as negatively impacted.

Table 6. Visual analog pain rating scale

Years of working	At rest	On activity	P- Value
10-12	2.5±1.35	5.1±1.9	0.0017
13-15	3.5±1.2	7.6±1.6	
16-18	4.3±1.3	7.9±2.0	
19-21	4.7±1.3	8.2±2.0	
22-24	4.9±1.2	8.6±1.8	

Interpretation

Table 6 lists the values of the Visual Analog Pain Rating Scale and the years of experience of workers on construction sites. P=0.0017 deems them to be highly significant. Based on the observed pattern, an increase in working experience is accompanied by an increase in discomfort experienced. In workers who have been employed for 22–24 years, it almost approaches a count of nine. It is shown to be lowest among employees who have worked for 10 to 12 years.

Table 7. Range of motion of spine

Cervical Flexion	86.2±3.62º
Cervical Extension	64.8±7.02º
Lateral Flexion	36.5±6.1º
Cervical Rotation	85.7±6.1º
Thoracolumbar Flexion	10.9±1.2 cm
Thoracolumbar Extension	2.4±0.18 cm

Interpretation

The average values for the cervical and thoracolumbar spine's range of motion are shown in Table 7.A goniometer was used to assess cervical flexion, extension, lateral flexion, and cervical rotation in accordance with the spine's range of motion. Cervical flexion and extension were somewhat greater than normal in these. The Schober's approach was utilized to measure the flexion and extension of the thoracolumbar region. They also showed higher-than-normal readings. This demonstrated that over time, employees are more likely to have hypermobile joints.

Table 8. Nordic musculoskeletal discomfort scale

	Have you at any time during last 12 months had trouble in:	Have you had any trouble in the last 7 days? If yes, where?	Have you ever hurt your body part in an accident? If yes, where?
Neck	75.7%	29.9%	0%
Shoulder	45.7%	10.2%	14.01%
Wrist/hand	23.3%	13%	26.1%
Upper back	89.7%	80.3%	2.8%
Lower back	72.8%	81.3%	0.9%
Hip/thighs	4.6%	8.4%	0.9%
Knees	43.9%	56.07%	10.2%
Ankle	5.6%	12.1%	14.9%
None	0.9%	0.9%	41.1%

Interpretation

The Nordic Musculoskeletal Discomfort Scale is shown in Table 8. It was discovered that throughout the preceding year, 75.7% of employees had neck discomfort, 45.7% had shoulder discomfort, 23.3% had wrist or hand discomfort, 89.7% had upper back pain, and 72.8% had lower back pain. Just 4.6% reported hip or thigh pain, 43.9% reported knee pain, and 5.6% reported ankle pain. In the week prior, 10.2% of workers reported shoulder discomfort, 13% reported wrist discomfort, and 29.9% of workers reported neck pain. About 80% of workers reported having different problems with their upper and lower backs, 56.07% with their knees, and 12% with their ankles. Worker injuries included 14.01% to the shoulder, 26.1% to the wrist, and only 2.8% to the upper back. Each of the lower back and hips makes up 0.9%. Roughly 10% reported knee pain and 14.9% reported ankle pain.

DISCUSSION

The purpose of the study, "Estimation of Spinal Dysfunction," was to measure the degree of spinal dysfunction experienced by workers on construction sites by considering various factors such as years of experience, posture, range of motion, muscle strength, pain, and discomfort. A total of 107 construction site laborers, both male and female, between the ages of 25 and 45, who had worked for more than ten years and five or more hours a day, and who had a normal body mass index (BMI), were included in the study. According to research by Lette, Abate, et al., 43.9% of workers in the building industry experienced a musculoskeletal disorder within the preceding year. Upper back, wrist/hand, and lower back diseases were the three most prevalent musculoskeletal conditions in this study. Because of their repetitive uncomfortable postures, high levels of stress at work, and heavy lifting, construction site workers have a higher-than-average risk of acquiring low back pain, according to the prevalence statistics (Lette & Abate, et al. 2019).

In this study, 107 construction labourers were approached from various construction sites in Maharashtra. After the selection of participants as per the criteria of the study, they were informed about the study and written consent was taken. Our investigation examined spinal dysfunction using the double leg lowering test, Nordic Musculoskeletal discomfort scale, Visual analogue pain rating scale, range of motion, muscle strength and posture assessment. These outcome measures have proven reliability and validity. The results of our study revealed that female workers who participated in the study (table 1), the mean age ranged from 25 to 45 years, most participants had 10-12 years of working experience and worked for 7-9 hours every day.

Musculoskeletal symptoms were found to be more common in workers who had long workdays, awkward postures, insufficient breaks, and repetitive movements. When workers performed the same motion too frequently, too quickly, or for too long, or when they involved the same joints and muscle groups, these symptoms were especially dangerous (Reddyet al., 2016). The lumbar region is the body part most affected by musculoskeletal symptoms (MS) in construction workers, with a prevalence of 51% over the course of a year, along with knee, shoulder, and wrist musculoskeletal symptoms, according to a 2018 systematic review of literature on the prevalence of musculoskeletal symptoms in the industry. The study aimed to synthesize musculoskeletal symptoms prevalence in different construction trades, gender, and age groups (Umer et al., 2018). The capacity of the spinal group of muscles to carry out tasks is known as spinal muscular performance. Poor muscle performance may play a role in the development of both mechanical and non-mechanical lower back pain. According to SB Shinde, their study discovered that IT professionals have lower spinal muscle performance. In comparison to static abdominal muscle performance, it was determined that there was a considerable decrease in static extensor performance (Sandeep & Radha et al., 2021).

The ergonomic evaluation of work-related musculoskeletal disorders among construction laborers working in unorganized sectors in West Bengal, India" is the title of a 2010 study (Sahu & Subhashis et al., 2010) which comprised 90 women and 140 men working on construction sites, sought to learn more about musculoskeletal symptoms including pain by using the Nordic questionnaire. One of the biggest ergonomic stressors for the prevalence of low back pain is the fact that, according to Sahu, Subhashis, et al., (2010), industry workers routinely lift and carry loads significantly above the National Institute for Occupation Safety & Health Recommended Weight limit (NIOSHRWL). Furthermore, many uncomfortable positions have been linked to musculoskeletal conditions, where bending or twisting the trunk is a common cause of low back pain. Additionally, the low back had the highest level of postural stress compared to all other body joints because forward bending of the back was the most repeated uncomfortable position. A musculoskeletal problem of the low back may be the cause of the low back discomfort that 49.2% of male laborers and 51.1% of female laborers reported having for seven days (Sahu & Subhashis et al. 2010).

According to a study by Telaprolu Neeraja, data suggested that women had greater exposure to repetitive hand movements and working in a general body static position (more standing than seated). Men's jobs were defined by a little bit more weight lifting and a dynamic body posture that suggested more walking during the workday (Neeraja et al., 2014). Our findings showed a strong correlationbetween the type of workers, including lifters and equipment operators as well as Masons, roofers, and plasterers, and their postural anomalies (p=0.0376).The spinal range of motion was considerably decreased in patients with lymphedema in breast cancer survivors, according a study titled Analysis of Spinal Dysfunction in Breast Cancer Survivors with Lymphedema.The lateral muscles of the spine, the abdominals, and the extensors all had much decreased strength and endurance.Our study found a significant correlation (P=0.0001) between the workers' employment history and their performance on the double leg lowering test.As workers' experience in work increased, their abdominal strength decreased (Babasaheb & Shinde Sandeep, et al. 2021). Adeyemi et al conducted a study in which it was concluded that manual handling tasks still carry a sizable amount of physical stress. Information about protecting workers from sickness and injuries at construction sites is seriously lacking. The outcomes of the tasks analysis showed that ergonomics have a relatively small role in the building sites that were under study.Most workers who conduct manual lifting tasks will face an elevated risk of workplace accidents.Mortar lifting tasks had the highest Lifting index scores of all the vocations evaluated (Adeyemi & Oluwole, et al., 2013).

According to our research, 66.6% of laborers performed poorly on the double leg lowering exam. It is a sign of weak abdominal muscles, which in turn places a great deal of strain on the spine when carrying loads. Workers in occupations with 35% or higher rates of low back pain incidence, such as welders, reinforcing bar placers, plasterers, interior finishers, roofers, bricklayers, and tilers, frequently have to adopt anti-physiological postures for extended periods of time due to the unique aspects of their jobs, according to Kaneda et al.'s study. He thought that the development of LBP was significantly influenced by these uncomfortable and restricting positions. A multi-regression analysis of the risk factors for low back pain (LBP) showed that the postures associated with twisting, deep forward bending, half bending, and unstable body balance on scaffolding had the strongest correlations with the development of LBP among working conditions (Kaneda et al., 2001). A review done by M. Gervais, there is an obvious need to raise awareness about the benefits of preventing back diseases in the construction industry. In fact, the success of any prevention program depends on such an awareness effort.There is general agreement in the literature that building projects need to be better planned and managed, and that decisions about occupational health and safety need to be made with the long-term effects in mind (Gervais & Michèle et al. 2003).

It should be made clear that enforcing preventative measures and an intertwined accoutrements operation program (delivery, storehouse, business inflow, robotization) will only be effective in achieving these pretensions if dangerous runningoperations are linked and suitable preventative measures are planned before the factual construction work begins.Due to the near- irreversibility of these spinal changes, preventives must be taken to help them entirely or incompletely, as well as to insure that workers are defended from spinal dysfunction indeed after long shifts. Feedback on work procedures, information sharing about proper running ways, and training are all exemplifications of operation ways that support safety and the avoidance of reverse problems. Also, it's possible to arrange construction work to lessen stress and weariness by giving peer- support mechanisms is one illustration of this strategy (Gervais and Michèle et al., 2003) rotating the workers in chargeof delicate jobs, including 15-alternate microbreaks to stretch and rest the reverse as well as paid warm- up and back exercise intervals, abstain from working overtime, which is linked to an increased threat of back injuries. For those who work in concrete buttressing, produce ministry that will allow you to move and store sword rods at midriff height.Use a Swedish tying machine to tie rods from a standing position.Rather than using sword rods, use welded fabric network.Install supports that let you store rods at the same height as the bending or cutting outfit [to avoid lifting].give enough mechanical backing, similar as bottom pedals, conveyors, wagons, handles, regulators, and electric or mechanical hoists (Gervais and Michèle et al., 2003).

For operators of heavy equipment create a more ergonomic driving system by revising the placement of levers, improving the quality of chairs, and creating adjustable seats with lumbar supports. Create a crane that is independent of the position of the cabin. Enhance sight fields by increasing the surface area of windows by 50% and extending them to the cabin's floor and minimize vibration for carpenters, give workers tables or sawhorses that can be adjusted in height. Use hammers with curved handles for greater ergonomics and lighter steel-shafted hammers. Utilize shovels with curved, longer handles. Drywall sheets can be moved using dollies by adding handles to them. When moving or installing insulation, use mechanical aids and lifts. Use machinery that is simpler to disassemble. To hold tools overhead, use supports. Belts can be used to stop tool kickback. On the ground, assemble the rooftops. Install safety rails (Gervais and Michèle et al., 2003). For roofers make their materials more compact. Transport tar paper with a cart. Use two-wheeled wheelbarrows rather than one-wheeled ones. Utilize machinery to take off the shingles. Modify the geometry of the structural components and lessen their size and weight. Utilize a method that enables workers to continue to stand. A mini-spreader should always be used. Use ladders that are sufficiently long. Install guardrails on beams for high-steel workers. Provide reusable floors and guardrails for workstations. Install catwalks and improve access to workstations. Provide harness hitch points. To perform tasks at relatively low heights, use mobile platforms. Regular building work necessitates repeatedly lifting things to shoulder height. Reduced blood supply, recurrent straining of tendons, rupture of the muscle fibers, and contractile forces acting on the cervical spine have all been related to the prolonged activity of neck muscles during these tasks. While repetitive straining on the cervical vertebrae has been linked to degenerative conditions including disc herniation and cervical spondylosis, repetitive straining on the muscles and tendons has been linked to muscle-specific neck ailments like tension neck syndrome (Nimbarte & Ashish et al., 2010).

Given that lifting tasks are inherently linked to the construction industry, alternate materials (such as lightweight concrete blocks), pre-blended grout and mortar, techniques, and equipment (such as vacuum lifters) could be employed to reduce the risk of neck injuries among construction workers (Kaneda et al., 2001). Because of the ergonomic risks they encounter on the job, musculoskeletal disorders are a common aftereffect for construction workers and can have a serious negative effect on health. Factors that are linked to the health impact include low-income status, immigration status, unfavorable work attributes, substandard housing, and unfavorable environmental factors (Meo et al., 2013). If used sooner and more effectively than later, all the aforementioned strategies will help lower the prevalence of spinal dysfunction among workers on construction sites. If workers who complain about pain and discomfort in certain body parts receive proper rehabilitation, it may be possible to reduce their impairment, enhance their health, and reduce the amount of time they miss from work due to accidents at work (Sahu and Subhashis et al. 2010). Smaller sample size, a smaller geographic area, and accessibility to remote locations were limitations of this study. It is advised that future studies take these variables into account to generalize the findings. This study will be helpful when treating construction site labourers with spinal dysfunction.

Conclusion

Studies indicate a link between low back pain and challenging work-related postures like trunk flexion, trunk rotation, and lifting over the past few decades. According to our research primary prevention of lower back pain may be accomplished more successfully if preventive measures consider attitudes regarding pain as well as the ergonomic work environment. Based on our findings, it was found that construction site workers with 10+ years of experience, undergo significant spinal dysfunction due to decreased abdominal muscle strength, resulting in increased strain on their spines. Construction workers, including lifters, equipment operators, masonry, roofers, and plasterers, exhibit significant postural anomalies and hypermobile spines due to ongoing stress and strain. This results in significant spinal dysfunction after years of continuous operation on construction sites.

ACKNOWLEDMENT

We acknowledge the guidance Dr. G. Varadharajulu, Dean, Krishna College of Physiotherapy, KIMSDU Karad and Dr. Kakade SV, for statistical help

Conflict of İnterest

There are no conflicting relationships or activities.

Ethics Statement

This research followed ethical standards and received approval from the Institutional Ethical Committee of Krishna Vishwa Vidyapeeth, KIMSDU dated 19/05/2023 and numbered 612/2022-2023.

Author Contributions

Design of the Study, SS and TH; Data Gathering, PJ; Statistical Evaluation, SS; Data interpreting PJ and TH; Writing of the Manuscript, PJ and SS; and Search of the Literature, TH and SS. Each author has reviewed the final draft of the manuscript and given their approval.

REFERENCES

Abrams, D., Davidson, M., Harrick, J., Harcourt, P., Zylinski, M., & Clancy, J., et.al. (2006). Monitoring the change: current trends in outcome measure usage in physiotherapy. *Manual therapy*, *11*(1), 46-53. [CrossRef]

Adeyemi, O., Adejuyigbe, S., AkanbI, O., Ismaila, S., & Adekoya, A. F. (2013). Manual lifting task methods and low back pain among construction workers in the Southwestern Nigeria. *Global J Res Eng*, *13*(3), 27-34. [PubMed].

Alghadir, A. H., Anwer, S., Iqbal, A., & Iqbal, Z. A. (2018). Test–retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement of osteoarthritic knee pain. *Journal of pain research*, 851-856.[PubMed]

Armstrong, T. J. (1986). Upper-extremity posture: definition, measurement and control. *The ergonomics of working postures*: Models, Methods and Cases. Taylor & Francis, London: 59-73. [PubMed]

Armstrong, T. J., Buckle, P., Fine, L. J., Hagberg, M., Jonsson, B., Kilbom, A., et al. (1993). A conceptual model for work-related neck and upper-limb musculoskeletal disorders. *Scandinavian journal of work, environment & health*, 73-84. [PubMed]

Babasaheb, S. S., Rajesh, K. K., Yeshwant, K. S., & Patil, S. (2021). Analysis of spinal dysfunction in breast cancer survivors with lymphedema. *Asian Pacific Journal of Cancer Prevention: APJCP*, *22*(6), 1869. [PubMed]

Baruah, B. (2010). Gender and globalization: opportunities and constraints faced by women in the construction industry in India. *Labor Studies Journal*, *35*(2), 198-221.[PubMed]

Bowles, P., & MacPhail, F. (2008). Introduction to the special issue on pathways from casual work to economic security: Canadian and international perspectives. *Social Indicators Research*, *88*, 1-13. [CrossRef]

Buchholz, B., Paquet, V., Punnett, L., Lee, D., & Moir, S. (1996). PATH: A work sampling-based approach to ergonomic job analysis for construction and other non-repetitive work. *Applied ergonomics*, *27*(3), 177-187. [PubMed]

Chiluba, B. C., Chansa, C., Chikoti, M., Thewo, S., & Sakala, S. (2019). A Comparison of The Prevalence of Low Back Pain in Formal and Informal Occupation Setup: A Review of The Literature. *Journal of Integral Sciences*, 24-28. [CrossRef]

Corlett, E. N., & Bishop, R. P. (1976). A technique for assessing postural discomfort. *Ergonomics*, *19*(2), 175-182. [PubMed]

Cuthbert, S. C., & Goodheart Jr, G. J. (2007). On the reliability and validity of manual muscle testing: a literature review. *Chiropractic & osteopathy*, *15*(1), 4. [PubMed]

Dawson, A. P., Steele, E. J., Hodges, P. W., & Stewart, S. (2009). Development and test–retest reliability of an extended version of the Nordic Musculoskeletal Questionnaire (NMQ-E): a screening instrument for musculoskeletal pain. *The Journal of Pain*, *10*(5), 517-526.[PubMed]

Gervais, M. (2003). Good management practice as a means of preventing back disorders in the construction sector. *Safety science*, *41*(1), 77-88. [CrossRef]

Häkkänen, M., Viikari-Juntura, E., & Takala, E. P. (1997). Effects of changes in work methods on musculoskeletal load. An intervention study in the trailer assembly. *Applied Ergonomics*, *28*(2), 99-108. [PubMed]

Harrianto, R., Samara, D., Tjhin, P., & Wartono, M. (2009). Manual handling as risk factor of low back pain among workers. *Universa Medicina*, *28*(3), 170-178. [CrossRef]

Haslam, R. A., Hide, S. A., Gibb, A. G., Gyi, D. E., Pavitt, T., Atkinson, S., et al. (2005). Contributing factors in construction accidents. *Applied ergonomics*, *36*(4), 401-415. [PubMed]

Holmström, E. B. (1992). Musculoskeletal disorders in construction workers related to physical, psychosocial, and individual factors. *Acta Orthopaedica Scandinavica*, *63*(sup247), 55-55. [CrossRef]

Jain, S., Shinde, S., & Jain, P. Correlation Between Direction of Prolapsed Intervertebral Disc (PIVD) And Lumbar Vertebral Alignment. *International Journal of Disabilities Sports and Health Sciences*, *7*(2), 315-325. [CrossRef]

Jinadu, M. K. (1987). Occupational health and safety in a newly industrializing country. *Journal of the Royal Society of Health*, *107*(1), 8-10. [PubMed]

Kaneda, K., Shirai, Y., & Miyamoto, M. (2001). An epidemiological study on occupational low back pain among people who work in construction. *Journal of Nippon Medical School*, *68*(4), 310-317. [PubMed]

Kulkarni, M., & Shinde, S. B. (2020). Effect of occupational load specific exercise protocol on cumulative trauma disorder of upper limb in construction workers. *Age*, *25*(30), 31-45. [CrossRef]

Kusmasari, W., & Sutalaksana, I. Z. (2018). Risk factors for musculoskeletal symptoms of construction workers: a systematic literature review. *KnE Life Sciences*, 1-15. [CrossRef]

Latza, U., Karmaus, W., Stürmer, T., Steiner, M., Neth, A., & Rehder, U. (2000). Cohort study of occupational risk factors of low back pain in construction workers. *Occupational and environmental medicine*, *57*(1), 28-34. [PubMed]

Latza, U., Pfahlberg, A., & Gefeller, O. (2002). Impact of repetitive manual materials handling and psychosocial work factors on the future prevalence of chronic low-back pain among construction workers. *Scandinavian journal of work, environment & health*, 314-323. [PubMed]

Lette, A., Hussen, A., Kumbi, M., Nuriye, S., & Lamore, Y. (2019). Musculoskeletal pain and associated factors among building construction workers in southeastern Ethiopia. *Ergonomics Int J*, *3*(5), 000214. [CrossRef]

Martin, D. P., Engelberg, R., Agel, J., Snapp, D., & Swiontkowski, M. F. (1996). Development of a musculoskeletal extremity health status instrument: the Musculoskeletal Function Assessment instrument. *Journal of Orthopaedic Research*, *14*(2), 173-181. [CrossRef]

Meo, S. A., Alsaaran, Z. F., Alshehri, M. K., Khashougji, M. A., Almeterk, A. A. Z., Almutairi, S. F., et al. (2013). Work-related musculoskeletal symptoms among building construction workers in Riyadh, Saudi Arabia. *Pakistan journal of medical sciences*, *29*(6), 1394. [PubMed]

Mishra, A. K. (2012). Planned Development and Social Security Measures for Unorganised Workers: Retrospect and Prospects in India. *IASSI-Quarterly*, *31*(2), 60-78.[CrossRef]

Mutatkar, R. (2013). Social protection in India: Current approaches and issues. *Social protection, economic growth and social change*, 102-116. [CrossRef]

Neeraja, T., & SWAROCHISH, C. (2014). The factors associated with MSDs among construction workers. *Journal of human ergology*, *43*(1), 1-8. [CrossRef]

Neeraja Telaprolu, N. T., Bhanwar Lal, B. L., & Swarochish Chekuri, S. C. (2013). Work related musculoskeletal disorders among unskilled Indian women construction workers.[CrossRef]

Nimbarte, A. D., Aghazadeh, F., Ikuma, L. H., & Harvey, C. M. (2010). Neck disorders among construction workers: understanding the physical loads on the cervical spine during static lifting tasks. *Industrial health*, *48*(2), 145-153. [PubMed]

Ponnuswamy, B. (2003). Socioeconomic conditions of workers in urban informal sector a study of construction workers in chennai city.[CrossRef]

Punnett, L., Prüss-Ütün, A., Nelson, D. I., Fingerhut, M. A., Leigh, J., Tak, S., et al. (2005). Estimating the global burden of low back pain attributable to combined occupational exposures. *American journal of industrial medicine*, *48*(6), 459-469. [PubMed]

Punnett, L., & Wegman, D. H. (2004). Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *Journal of electromyography and kinesiology*, *14*(1), 13-23.[PubMed]

Rajasekhar, D., Suchitra, J. Y., Madheshwaran, S., & Karanth, G. K. (2006). *At times when limbs may fail: Social Security for Unorganised workers in Karnataka* (No. id: 331).[CrossRef]

Rathod, S. R., Vyas, N. J., &Sorani, D. M. (2021). Relationship between double leg lowering test and core strength test of the lumbar spine in normal healthy individuals. *Journal of Mahatma Gandhi Institute of MedicalSciences*, *26*(1), 23-27. [CrossRef]

Reddy, G. M., Nisha, B., Prabhushankar, T. G., & Vishwambhar, V. (2016). Musculoskeletal morbidity among construction workers: A cross-sectional community-based study. *Indian journal of occupational and environmental medicine*, *20*(3), 144-149. [PubMed]

Roy, D. (2022). Occupational health services and prevention of work-related musculoskeletal problems. In *Handbook on Management and Employment Practices* (pp. 547-571). Cham: Springer International Publishing. [CrossRef]

Sahu, S., SETT, M., & Gangopadhyay, S. (2010). An ergonomic study on teenage girls working in the manual brick manufacturing units in the unorganized sectors in West Bengal, India. *Journal of Human Ergology*, *39*(1), 35-44. [CrossRef]

Sahu, S., Chattopadhyay, S., Basu, K., & Paul, G. (2010). The ergonomic evaluation of work-related musculoskeletal disorders among construction labourers working in unorganized sectors in West Bengal, India. *Journal of human ergology*, *39*(2), 99-109. [CrossRef]

Shinde, S., &Ghadage, P. (2022). Return to job of a construction worker by comprehensive functional and vocational rehabilitation. *International Journal of Disabilities Sports and HealthSciences*, *5*(2), 150-157.[CrossRef]

Shinde, S. B., & Bhende, R. P. (2023). Estimation of spinal muscle performance in work from home information technology professionals of karad, India in 2021. *Indian journal of occupational and environmental medicine*, *27*(2), 138-142. [PubMed]