Section: Rehabilitation Medicine

Original Research Article

BIOMECHANICAL RISK FACTORS AND THEIR ASSOCIATION WITH DIFFERENTIAL DIAGNOSES OF WORK-RELATED LOW BACKACHES AMONG UNORGANIZED WORKERS

Received : 03/01/2024
Received in revised form : 26/02/2024
Accepted : 10/03/2024

Keywords:
Lower back pain (LBP), lower back ache (LBA), work-related musculoskeletal disorders (WRMSD), lumbar disc degeneration.

Corresponding Author:
Dr. K. Sathish,
Email: krissathish_78@yahoo.co.in.

DOI: 10.47009/jamp.2024.6.2.98

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 454-457

K.Chitrarasu[1], K. Sathish[2]

[1]Assistant Professor, Government Institute of Rehabilitation Medicine, Attached to Madras Medical College, Tamilnadu, India.
[2]Assistant Professor, Department of Physical Medicine and Rehabilitation, Government Tiruvannamalai Medical College, Tamilnadu, India.

Abstract

Background: Work-related musculoskeletal disorders (WRMSD) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs that are induced or aggravated by work and the circumstances of its performance. **Aim:** This study aimed to identify the corresponding risk factors and their patterns of occurrence in various differential diagnoses in individuals with work-related low back aches (LBA). **Material and Methods:** This was a prospective observational study of 161 patients attending the occupational health clinic of the PMR OPD at the Govt Institute of Rehabilitation Medicine, Chennai, who were older than 18 years between June 2023 and February 2024. The awkward posture of the lumbar spine (backward bending, forward bending, twisting), repetitions of movements (more than 30 per hour), and force exertion were assessed. **Results:** Most 161 patients were aged–41-50 (n=48, 29.8%). The female population (65.2%) were more likely to have work-related backaches than the male population (34.8%). In the majority of the population, 37 patients (47.4%) had diabetes mellitus, and 31 (39.7%) had hypertension. Lumbar disc degeneration was the most prevalent diagnosis, affecting 40.4% of the patients, followed by sacroiliac joint pain (21.7%) and lumbar spondylolisthesis (14.9%). Patients exhibited various difficulties in static posture, with sitting alone being the most common issue (33.5%). The majority of patients required support for lumbar flexion (70.8%) and posterior pelvic support (77.9%). Bending was the most common repetition cycle (45.3%). **Conclusion:** Patients involved in the forward-curving pattern of work were more highly affected by LBA. Lumbar disc degeneration is the most commonly diagnosed condition in patients with lower back pain.

INTRODUCTION

Work-related musculoskeletal disorders (WRMSD) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs that are induced or aggravated by work and the circumstances of its performance. In contemporary industrialized societies, low back pain (LBP) is one of the most common occupational health issues that causes a significant number of missed days of work and worker disability.[1] The art and science of designing a job to fit the worker is known as occupational ergonomics. Ergonomic principles, which can have detrimental effects on employee health and safety, are frequently ignored in workplace design. These effects can include musculoskeletal disorders, cardiovascular and cerebrovascular disease, poor reproductive outcomes, psychological distress, and an increased risk of acute injury.[2]

Lower back pain can be acute or chronic, affecting the buttocks, upper legs, or lumbosacral region. Most cases of lower back pain have no clear cause. There is substantial evidence linking heavy manual labour, whole-body vibration, bending and twisting of the trunk, and forceful lifting to an increased risk of lower back disorders in the workplace. Low back pain (LBP) may also be exacerbated by static work postures like standing or sitting for extended periods.[3] A lumbar disk herniation, sacroiliac joint pain, zygapophyseal joint pain, diskogenic pain, piriformis syndrome, spondylolisthesis, lumbosacral plexopathy, and, in today's ageing workforce, exacerbation of lumbar spinal stenosis should all be considered possibilities in the differential diagnosis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

of this patient who presents with both LBP and referred leg symptoms.[4]

Gender differences can't be considered significant, and the prevalence of LBP is highest between the ages of 35 and 55.[5] While most people with LBP recover from an acute episode and can resume work in a few days or weeks, some people experience pain that worsens over time and becomes a chronic, debilitating condition that affects them for the rest of their lives.[6] A sustained return to work is regarded as a crucial objective during the healing process following an injury in the field of occupational health.[7] These disorders are seldom life-threatening, but they impair the quality of life of a large proportion of the adult population.

Aim

This study aimed to identify the corresponding risk factors and their patterns of occurrence in various differential diagnoses in individuals with work-related low back aches (LBA).

MATERIALS AND METHODS

This was a prospective observational study of 161 patients above 18 years of age attending the occupational health clinic under the PMR OPD at the Govt Institute of Rehabilitation Medicine, Chennai, from June 2023 to February 2024. The study was approved by the institutional ethics committee before initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Patients who were more than 18 years of age had a differential diagnosis of low back pain, such as lumbar canal stenosis, lumbar disc disease, lumbosacral radiculopathy, myofascial pain syndrome, sciatica, sacroiliac joint pain, spondylolisthesis, and spondylolysis.

Exclusion Criteria

Patients with LBA unrelated to occupation, infectious cause, neoclassical cause, or rheumatological aetiology.

Data were collected from patients attending an occupational health clinic under the PMR OPD at the Govt Institute of Rehabilitation Medicine in Chennai. Risk factors, including awkward posture of the lumbar spine (backward bending, forward bending, and twisting), repetitions of movements (more than 30 per hour), and force exertion, were assessed. Morbidity ratings in low back ache, pain NPRS, and ODI disability were also assessed.

Statistical Analysis

The data collected during the study were formulated into a master chart using Microsoft Office Excel, and statistical analyses were performed using the statistical software package SPSS V.17 for Windows.

RESULTS

Of the 161 patients, the largest proportion belonged to the age group of 41–50 years, accounting for 29.8% of the total population. This was followed by patients aged 31–40 years, accounting for 26.1% of the population. Subsequently, patients aged 51–60 years constituted 23% of the population, while those aged < 30 years represented 14.3% of the population. Finally, 6.8% of the population were aged over 60 years. The gender difference showed that the female population (65.2%) was more likely to have work-related backaches than the male population (34.8%). BMI calculation showed that 8 patients (5%) were underweight, 81 patients (50.3%) were normal weight, 50 patients (31.1%) were overweight, and 22 patients (13.7%) were obese. Of the 161 patients, 78 were diagnosed with other comorbidities. In the majority of the population, 37 patients (47.4%) had diabetes mellitus, 31 (39.7%) had hypertension, 6 (7.7%) had Hodgkin lymphoma, and 4 (5.1%) had thyroid problems. [Table 1]

Among the 161 patients, seven developed facet joint syndrome, 18 developed lumbar canal stenosis, 65 developed lumbar disc degeneration, 24 developed lumbar spondylolisthesis, 12 developed multifactorial pain syndrome, and 35 developed sacroiliac joint pain.

While assessing the positioning of the lumbar spine of the patients, seven patients (4.9%) were involved in the forward pelvic pattern of work, seven patients (4.9%) were involved in the forward pelvic zone pattern of work, 82 patients (56.9%) were involved in the forward curve pattern of work, 15 patients (10.4%) were involved in the forward lifting pattern of work, 14 patients (9.7%) were involved in the forward head lifting pattern of work, and 32 patients (19.9%) were involved in the ergonomic pattern of work. [Table 2]

The differential diagnosis of the patients showed that lumbar disc degeneration was more prevalent among the population as it affected 65 patients (40.4%), followed by 35 patients (21.7%) who developed sacroiliac joint pain, 24 patients (14.9%) who developed lumbar spondylolisthesis, 18 patients (11.2%) who developed lumbar canal stenosis, 12 patients (7.5%) who developed multifactorial pain syndrome, and 7 patients (4.3%) who developed facet joint syndrome.

While examining the static posture, it was found that 54 patients (33.5%) had trouble sitting alone, 1 patient (0.6%) had trouble squatting alone, 45 patients (28%) had trouble standing alone, 10 patients (6.2%) had trouble sitting and squatting, 28 patients (17.4%) had trouble sitting and standing, 17 patients (10.6%) had trouble standing and squatting, and 6 patients (3.7%) had trouble standing, squatting, and sitting.

While evaluating the need for abdominal and kinetic lumbar support, 10 patients (6.2%) needed support

ISSN (O): 2687-5365; ISSN (P): 2753-6556

for bending and twisting, 37 (23%) needed support for lumbar extension, and 114 (70.8%) needed support for lumbar flexion. While evaluating the need for abdominal and kinetic pelvic support, 34 patients (22.1%) needed anterior support and 120 patients (77.9%) needed posterior support. On assessing the repetition cycle, bending was observed in 73 patients (45.3%), bending with twisting was observed in 33 patients (20.5%), and no repetition of any activity was observed in 55 patients (34.2%). [Table 2]

To assess the median values, the median value was calculated to be 7 for work hours, 62 for the Pre-Oswestry Disability Index, 6 for the Pre-Numeric Rating Scale, 3 for the Muscle Balance-Pain Rating Scale, 2 for the Spinal Flexibility-Pain Rating Scale, 2 for Activities of Daily Living, 3 for the Post-Numeric Rating Scale, and 3 for the Dynamic Posture-Pain Rating Scale. [Table 4]

Table 1: Demographic data of the study

		Number of patients	Percentage
Age group	<30	23	14.3%
	31-40	42	26.1%
	41-50	48	29.8%
	51-60	37	23.0%
	>61	11	6.8%
Sex	Female	105	65.2%
	Male	56	34.8%
BMI	Underweight	8	5.0%
	Normal weight	81	50.3%
	Overweight	50	31.1%
	Obese	22	13.7%
Co-morbidities	Diabetes mellitus	37	47.4%
	Hypertension	31	39.7%
	Thyroid	4	5.1%
	Hodgkin lymphoma	6	7.7%

Table 2: Pattern of work

	Number of patients (%)	
	No	Yes
Forward Pelvis	137 (95.1%)	7 (4.9%)
Forward Pelvis Zone	137 (95.1%)	7 (4.9%)
Forward Curve	62 (43.1%)	82 (56.9%)
Forward Lifting	129 (89.6%)	15 (10.4%)
Forward Head Lifting	130 (90.3%)	14 (9.7%)
Ergonomics	129 (80.1%)	32 (19.9%)

Table 3: Differential diagnosis of lower back pain

		Number of patients	Percentage
Diagnosis	Facet Joint Syndrome	7	4.3%
	Lumbar Canal Stenosis	18	11.2%
	Lumbar Disc Degeneration	65	40.4%
	Lumbar Spondylolisthesis	24	14.9%
	Multifactorial Pain Syndrome	12	7.5%
	Sacroiliac Joint pain	35	21.7%
Static Posture	Sitting	54	33.5%
	Squatting	1	0.6%
	Standing	45	28.0%
	Sitting + Squatting	10	6.2%
	Sitting + Standing	28	17.4%
	Standing + Squatting	17	10.6%
	Standing + Squatting + Sitting	6	3.7%
Abdominal and Kinetic Lumbar Support	Bending with Twisting	10	6.2%
	Lumbar Extension	37	23.0%
	Lumbar Flexion	114	70.8%
Abdominal and Kinetic Pelvic Support	Anterior	34	22.1%
	Posterior	120	77.9%
Repetition Cycle	Bending	73	45.3%
	Bending with Twisting	33	20.5%
	No Repetition	55	34.2%

Table 4: Median values of different pain scales

	Median	Percentile 25	Percentile 75
Work hours	7.00	6.00	8.00
Pre Oswestry-Disability Index	62.00	52.00	72.00
Pre-Numeric Rating Scale	6.00	6.00	8.00
Muscle Balance - Pain Rating scale	3.00	3.00	3.00

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Spinal Flexibility - Pain Rating scale	2.00	2.00	3.00
Activities of Daily Living	2.00	2.00	3.00
Post Numeric Rating Scale	3.00	3.00	3.00
Dynamic Posture - Pain Rating scale	3.00	2.00	3.00

DISCUSSION

The present study demonstrated various possible differential diagnoses of patients with lower back pain (LBP) and its pattern of occurrence. Our study shows that LBP is more prevalent in the female population than in males and affects most people of normal weight; therefore, the weight factor does not play a significant role in the development of LBA.

In our study, hypertension and diabetes mellitus were the major comorbid conditions in the affected population. On assessing the pattern of work, it is evident that the patients who work by bending forward have a higher chance of developing LBA than any other bending or twisting work, which is similar to the findings of Gangopadhyay et al., who found that LBP is strongly linked to long work hours, a static sitting position, and a rigid work pattern. These factors impair the workers' quality of work, and the condition worsens with age.1 Jin et al, found that vibration, static posture, bending and twisting are associated with the prevalence of low back pain among common labourers.[8] Fritz et al. discovered that many people with heavy labour jobs who experience acute episodes of low back pain won't fully recover; instead, the pain will worsen and become chronic or recurrent.[9]

In our study, the differential diagnosis of the patients with LBA shows the maximum population is affected by lumbar disc degeneration and sacroiliac joint pain, which supports the findings of Oleske et al., who found that employment environments with greater ergonomic exposure conditions, such as manual material handling operations or even healthcare settings, may have a higher rate of recurrent episodes of LBP, which may develop into serious conditions such as lumbar disc degeneration and sacroiliac joint pain.[10] Based on prognostic studies, approximately 40% of patients with acute lower back pain (LBP) are at elevated risk, and 10% to 15% are at high risk of developing chronic disability.[6]

In our study, in assessing static posture, 33.5% of the population was found to have trouble even while sitting, and 28% were found to have trouble even while standing. The patients needed abdominal and kinetic lumbar support for lumbar flexion, which was more than that required for lumbar extension. The patients needed more abdominal and kinetic pelvic support for the posterior region than for the anterior region. When asked to perform the repetition cycle, 34.2% of the population could not repeat bending or twisting postures. These conditions may greatly influence their day-to-day activities and produce a negative impact on their quality of life, which supports the findings of Chibnall et al., who found the long-term clinical outcomes of low-back pain (LBP) are influenced by socioeconomic resources, which have a detrimental impact on their quality of life.[11] Our study showed the prevalence of work patterns with lower back pain in various ways by using various scales and the Pre-Oswestry Disability Index.

CONCLUSION

This study explains the association between various work patterns and the development of lower back pain. Further studies are needed to evaluate the association between every single risk factor and a particular clinical consequence.

Limitations

A limitation of this study is that the patient's full history was not collected, and there was no follow-up to assess the clinical outcome of LBP.

Financial support: Nil

Conflict of interest: Nil

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ISSN (O): 2687-5365; ISSN (P): 2753-6556