

## FREQUENCIES OF DIFFERENT PERIPHERAL NERVOUS SYSTEM PATHOLOGIES AMONG CASES OF LUMBAR RADICULAR PAIN USING ELECTRODIAGNOSTIC STUDIES

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### ABSTRACT

**Objective:** To discover the spectrum of diagnoses on nerve conduction studies/Electromyography in patients with lumbar radicular pain, test preponderance of the commonest pathology and correlate commonest pathology with age  $\geq 50$  years, gender and unilateral or bilateral involvement.

**Study Design:** A descriptive cross-sectional study of 539 patients.

**Place and Duration of the Study:** The department of Electrodiagnostic Studies, Armed Forces Institute of Rehabilitation Medicine, Rawalpindi from January 2012 to December 2012.

**Material and Methods:** Using non-probability consecutive sampling 539 patients referred with complaints of lumbar radicular pain were subjected to electrodiagnostic evaluation for presence of lumbosacral radiculopathy, polyneuropathy, sciatic nerve injury or a combination of these. The preponderance of commonest pathology was tested statistically. The frequencies were then related statistically to age  $\geq 50$  years, gender and unilateral or bilateral involvement.

**Results:** A total of 539 patients (age: 18- 85 years) were registered. 355 (66%) were males and 261 (48.4%) patients were  $\geq 50$  years. Nerve conduction studies/Electromyography findings were abnormal in 386 (77.6%) patients. The commonest diagnosis was lumbosacral radiculopathy in 65% followed by polyneuropathy with superimposed lumbosacral radiculopathy in 7%. The preponderance of lumbosacral radiculopathy was statistically found significant ( $p < 0.05$ ) and it was common in individuals  $\geq 50$  years.

**Conclusion:** Lumbosacral radiculopathy is highly expected to be found on nerve conduction studies / electromyography in patients who present with lumbar radicular pain. The lumbosacral radiculopathy is more common in individuals of age 50 years and above.

**Keywords:** Lumbar radicular pain, Lumbosacral radiculopathy, Nerve conduction studies / Electromyography, polyneuropathies, Sciatic Nerve injury.

### INTRODUCTION

Low back pain (LBP) has become a costly burden to the society and a leading cause of disability and loss of productivity. Studies have shown a lifetime prevalence of LBP as high as 84%<sup>1</sup>. Many etiologies have been linked to LBP. Lumbar radicular pain is a type of LBP that radiates into the lower extremity past the knee joint along course of a spinal nerve or a nerve root<sup>2,3</sup>. It is caused by compression, inflammation or injury to a spinal nerve, nerve root or multiple nerves<sup>4,5</sup>. It can be accompanied by numbness and tingling, muscle weakness or loss of reflexes<sup>5</sup>.

In majority of patients with symptoms of radicular pain, the diagnostic issue is to look for a radicular compression, usually related to disc disease or spinal stenosis, so that subsequent surgery can be planned<sup>5</sup>. Polyneuropathies or isolated nerve lesions, by and large mandate medical treatment<sup>5</sup>.

In patients presenting with leg pain greater than LBP, lumbar radiculopathy and stenosis are the most common etiologies<sup>6,7</sup>. Physical examination frequently reveals reduced lumbar range of motion, spasm of lumbar paraspinal muscles, lower extremity muscle weakness, reflex changes or sensory loss associated with an L4, L5 or S1 radicular patterns<sup>8</sup>. Presenting symptoms of polyneuropathy are pain, dysesthesias or weakness in feet and legs<sup>9,10</sup>. Signs associated with polyneuropathy usually are bilateral,

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relatively symmetrical, distal sensory loss and weakness and hypoactive or absent reflexes<sup>11,12</sup>. Plain radiographs, myelography, computerized tomography (CT) and magnetic resonance imaging (MRI), all are done to diagnose the causative agent.

Nerve Conduction Studies / Electromyography (NCS / EMG) have been suggested as substitutes for or a supplement to imaging examinations<sup>13</sup>. They are especially valuable in patients with negative findings on myelography or CT, or in patients with uncharacteristic clinical findings<sup>14</sup>. In such patients, NCS/EMG assessment gives clues to the nerve function and may reveal the site of the lesion<sup>14</sup>. There has been no study carried out in Pakistan on prevalence of electrodiagnostic (EDX) impressions concluded in patients with lumbar radicular pain. The purpose of this study was to discover the spectrum of EDX diagnoses in such patients, test preponderance of the commonest pathology and correlate commonest pathology with age  $\geq 50$  years, gender and unilateral or bilateral involvement..

**MATERIAL AND METHODS**

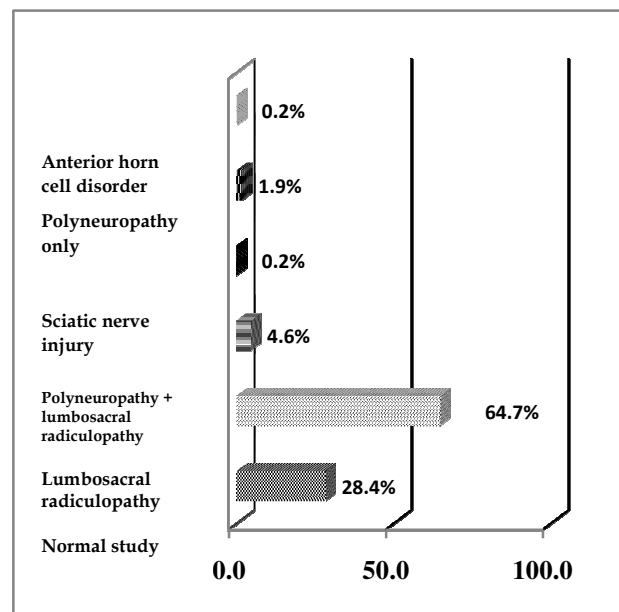
It was a cross-sectional study carried out at Department of EDX Studies, Armed Forces Institute of Rehabilitation Medicine (AFIRM), Rawalpindi from January 2012 to December 2012 after approval from the ethical review committee. Selection was through non-probability consecutive sampling. The selectees were all patients belonging to either gender and all ages, referred to AFIRM for NCS/EMG who presented with lumbar radicular pain. Radicular lumbar pain was defined as low back pain radiating into the legs past knee along the course of a spinal nerve or a nerve root<sup>2,3</sup>. Patients who had already been diagnosed as a case of polyneuropathy and patients having radicular symptoms in all limbs, spondyloarthropathies or an established psychiatric history were excluded.

All patients signed informed consent. The symptoms reported by the patient at time of test were noted. They were examined for clinical

signs of neuropathy or radiculopathy by assessing muscle strength (according to Medical Research Council Scale)<sup>15</sup> and deep tendon reflexes. Sensations for pin prick were tested via pin-wheel. All tests were carried out on XLTEK Neuromax 1004 EMG Unit using surface electrodes for NCS and concentric needle

**Table-1: Relationship of lumbosacral radiculopathy with age and gender.**

Variable	Sub variables	Present	Absent	p-value
Age group (years)	$\geq 50$	80.4%	19.6%	$< 0.001$
	$< 50$	59.1%	40.9%	
Gender	Male	69.6%	30.4%	0.894
	Female	69%	31%	



**Figure-1: Prevalence of different diagnoses based on electrophysiological findings.**

electrodes for EMG. Compound muscle action potential (CMAP) amplitude, distal motor latency (DML) and conduction velocity (CV) were recorded for common peroneal and tibial nerves and sensory nerve action potential (SNAP) amplitude, sensory peak latency (SPL) and conduction velocity (CV) were calculated for sural nerves on both sides. The EMG was carried out as per protocol i.e one myotome above and

one below the clinical suspected level. Fibrillation potentials and positive sharp waves at rest and large amplitude, long duration, polyphasic motor unit action potentials and reduced recruitment on muscle activation were considered abnormal.

### Statistical Analysis

All the data regarding demographical and clinical details and EDX parameters was registered and compiled for statistical analysis using IBM SPSS version 20.0. Patients were segregated into two groups based on age ( $\geq 50$  years and  $< 50$  years). Mean and SD were calculated for numerical variable i.e. age. Frequencies and percentages were calculated for categorical variables i.e. gender, age groups, EDX impression and unilateral or bilateral involvement. One-sample Kolmogorov-Smirnov test was used to assess the equality of continuous, one-dimensional probability distribution for the commonest EDX impression and Chi-square test was used for the unilateral/bilateral involvement of the commonest EDX impression. The impression was then related to age groups and gender by taking help of Pearson's Chi-square test. A  $p$ -value of  $< 0.05$  was considered significant.

### RESULTS

A total of 539 patients were registered with a mean age of  $49 \pm 15$  years (range: 18 - 85 years). Three hundred and fifty five (66%) patients were male and 184 (34 %) were female. 261 (48.4%) patients were  $\geq 50$  years and 278 (51.6%) were  $< 50$  years. NCS/EMG studies found an EDX diagnosis in 386 (77.6%) patients; however, they were normal in 153 (28.4%) patients. The most common EDX diagnosis was lumbosacral radiculopathy in 349 (64.7%) followed by polyneuropathy with superimposed lumbosacral radiculopathy in 25 (4.6%) and polyneuropathy in 10 (1.9%). Only one patient had sciatic nerve injury (0.2%) and another had anterior horn cell disorder (0.2%) (Figure-1). Out of 184 female patients, the diagnoses found were lumbosacral radiculopathy in 120 (65.2%), polyneuropathy with superimposed lumbosacral radiculopathy in

7 (3.8%), polyneuropathy in 3 (1.6%) and normal study in 54 (29.3%). Out of 355 male patients, the diagnoses found were lumbosacral radiculopathy in 229 (64.5%), polyneuropathy with superimposed lumbosacral radiculopathy in 18 (5.1%), polyneuropathy in 7 (2%) and normal study in 99 (27.9%). Lumbosacral radiculopathy as the major EDX outcome was found statistically significant ( $p < 0.001$ ). Lumbosacral radiculopathy was more common significantly ( $p < 0.001$ ) in individuals  $\geq 50$  years than individuals  $< 50$  years (80.4% vs 59.1%) and insignificantly ( $p = 0.894$ ) in males than females (Table-1). It was present unilaterally in 47.6% patients ( $n = 178$ ) and bilaterally in 52.4% patients ( $n = 196$ ) however it was statistically insignificant ( $p = 0.352$ ).

### DISCUSSION

NCS/EMG, nevertheless a useful diagnostic modality, yet considered an extension of clinical findings and must be performed after taking an appropriate history and performing a targeted physical examination<sup>16</sup>. NCS/EMG has a moderate sensitivity and high specificity for diagnosing radiculopathies and peripheral nerve entrapments<sup>17</sup>. If done correctly, it can serve to confirm the presence of radiculopathy, establish the involved nerve root level, determine if axonal loss or demyelination is present, grade the severity of the process, estimate the age of the radiculopathy and exclude other peripheral nerve diseases that mimic radiculopathy<sup>18</sup>. The sensitivity of NCS/EMG increases if the patients with clinical lumbosacral radiculopathy have positive findings on CT or MRI scans<sup>19,20</sup>.

Our study was dominated by male subjects who constituted 66% of the sample size and included patients as young as 18 years and as old as 85 years. The mean age was 49 years. It was comparable to the mean age of 58 years in the study conducted by Chokroverty and colleagues<sup>21</sup>.

The most frequent finding on basis of EDX studies was lumbosacral radiculopathy (65%) followed by polyneuropathy with superimposed lumbosacral radiculopathy and polyneuropathy.

The sciatic nerve injury and anterior horn cell disorder were rare. Internationally, reported prevalence of lumbosacral radiculopathy in patients with lumbar radicular pain is variable. A lower prevalence of 55% and 58.8% to a higher prevalence of 70.6% has been quoted by Nardin RA, Chang CW and Mičanková AB respectively<sup>22-24</sup>.

The study revealed frequency of normal electrophysiological findings as low as 28.4%. International studies cited above discovered the prevalence to be 45% and 41.2% respectively<sup>22,23</sup>. We found that radiculopathy was significantly more common in age group  $\geq 50$  years. Radiculopathies were also commoner in males than females and bilaterally than unilaterally however this relation was statistically insignificant. This is comparable to international study carried out by Kostova V<sup>25</sup>.

This was a large sample size study carried out for the first time in Pakistan in a tertiary care EDX center and it proved that patients presenting with lumbar radicular pain were significantly found to have a lumbosacral radiculopathy which is more common in people of age  $\geq 50$  years.

## CONCLUSION

Lumbosacral radiculopathy is highly expected to be found on NCS/EMG in patients who present with lumbar radicular pain. The lumbosacral radiculopathy is more common in individuals of age 50 years and above.

## Conflict of interest

The authors of the article did not mention any conflict of interest.

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