

Etiological Factors of Non-Traumatic Compressive Myelopathy

Rekha Kumari¹, Abdul Hafeez Bughio², Muslim Ali Lakhari³

Abstract

Objective: To determine the frequency of etiological factors of non-traumatic compressive myelopathies.

Methods: This is tertiary care Hospital based descriptive cross sectional study conducted at Neurology department of Liaquat University of medical and health Sciences, Jamshoro / Hyderabad after approval of departmental ethical committee from 22th October 2020 to 21st April 2021. Study data was collected after informed consent from all cases. All cases fulfilled inclusion criteria were selected and included in study and data was recorded on preformed proforma. Data was analyzed on SPSS 21 and results were formulated accordingly.

Results: In this study 163 patients were included to assess the etiological factors of non-traumatic compressive myelopathy and the results were analyzed. Out of these 163 subjects who had nontraumatic compressive myelopathies, the etiological and demographic features revealed that, 106 (65%) were male & 57 (35%) were female patients, having a 1.85:1 male to female ratio. The study population's age ranged from 20 to 60 years, and the mean age SD was 47.6 ± 11.2 years. One hundred and eleven 111 (68.1%) patients had paraparesis while fifty two 52 (31.9%) had Quadriparesis. Most common cause of non-traumatic compressive myelopathy was Tuberculosis spine 35(21.5%) followed by demyelinating Myelitis 30 (18.4%) spinal secondaries 24 (14.8%), disc prolapse was noted in 22(13.5%), multiple myeloma 12 (7.3%) cervical spondylosis 10(6.1%), spinal epidural abscess 8(4.9%), transverse myelitis 4(2.5%) while ossification of the posterior longitudinal ligament as 3(1.8%) patients.

Conclusion: Tuberculosis of spine followed by demyelinating Myelitis were most common causes of non-traumatic compressive myelopathies. It is of prime importance to identify those risk factors and contributing states that prone the population for the development of such disabling ailments to address the burden of diseases and to optimize the management's strategies for this already compromised patients.

Keywords: Myelopathy, Non traumatic Compressive Myelopathy, Paraparesis, Quadriparesis

IRB: Approved by Research Ethic Committee of Liaquat University of Medical and Health Science. Ref No. LUMHS/REC/-951. dated: 25th September 2020.

Citation: Kumari R, Bughio AH, Lakhari MA. Etiological Factors of Non-Traumatic Compressive Myelopathy [Online]. *Annals ASH & KMDC* 28(3)

(ASH & KMDC 28(3):142;2023)

Introduction

Myelopathy is defined as set of signs and symptoms produced by any kind of internal (also called intramedullary) or external (also called extramedullary) damage to the spinal cord. The myelopathy not only produce pyramidal and sensory deficits but it also alters the CSF flow through spinal canal. Myelopathy is classified into non-traumatic

and traumatic depending upon injury to spinal cord. So, damage to the spinal cord resulting from a non-traumatic cause is defined as non-traumatic myelopathy¹. Non traumatic myelopathy further divided into compressive and non-compressive myelopathies. Non traumatic compressive myelopathies manifest as large group of clinical conditions with different etiologic factors.

Non-traumatic spinal cord injury (NSCI) is a significant but under reported cause of paralysis². In developed countries the most common cause is tumors, either primary or metastatic, followed by age related causes like degenerative disc disease while in developing countries tuberculosis is the

¹⁻³ Liaquat University of Medical and Health Sciences

Correspondence: Dr. Abdul Hafeez Bughio
Liaquat University of Medical and Health Sciences

Email: dr.hafeez80@hotmail.com

Date of Submission:

Date of Acceptance: 29th August 2023

commonest cause with poverty, over population and malnutrition being the causative factors^{3,4}. However, in past few decades resurgence of tuberculosis has been seen in developed especially western countries, not only limited to pulmonary involvement, but also extended to involve extra pulmonary sites, e.g. the vertebra resulting in Potts disease^{5,6}.

This finding can largely be attributed to dynamic immigration patterns that have included an influx of persons from areas of the world where tuberculosis is endemic⁷. Diagnosis of tuberculosis is often very difficult because of varying clinical presentations and imaging in conjunction with clinical and laboratory test⁸. MRI is the gold standard for diagnosing cord compression and has an overall accuracy of 95%⁹. CT myelography is used in patients who are intolerant of closed spaces or who cannot undergo MRI¹⁰. MRI with and without gadolinium is better than CT myelography as far as diagnosis is concerned.

Non-traumatic spinal cord pathologies account for a surprisingly large part of the cases admitted in different wards for workup & management. There reported proportions for etiological factors of non-traumatic compressive myelopathies in various studies are disc prolapse (12%), cervical Spondylolysis (34%), Pott's disease (44%), tuberculosis spinal arachnoiditis (16%), spinal secondaries (19%), spinal epidural abscess (20%), multiple myeloma (18%), multiple sclerosis (15%), transverse myelitis (16%), and ossification of the posterior longitudinal ligament-OPLL (14%)¹¹⁻¹⁴.

Proper and early diagnosis is key to prevent long term disability from non-traumatic compressive myelopathies. In fact in emergency settings diagnosis is very challenging because of variable clinical features, late consultations and occurrence of multiple other non-spinal pathological entities that can resemble non-traumatic spinal cord pathologies. In certain pathologies of spinal cord like spinal dural arteriovenous fistulas or spinal hematomas diagnosis is either delayed or missed. Delayed diagnosis in neurological diseases

particularly in spinal cord injuries always lead to permanent disability in terms of paralysis, sphincter involvement and sexual dysfunction.

The prevalence of non-traumatic compressive myelopathy has been researched in a few nations around the world and was found to be 1120 per million people in Canada and 273000 per year in the USA, but little research has been done in our population. This study has establish the prevalence of various causes of non-traumatic compressive myelopathies in our population and provide guidance on how to take these causes into account while treating myelopathic patients.

Patients and Methods

This is Tertiary care Hospital based descriptive cross sectional study conducted at department of Neurology Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad after the approval of ethical committee from 22th October 2020 to 21st April 2021. The study's patient participants were those who met the eligibility requirements. Patients having a diagnosis of non-traumatic compressive myelopathy and an age range of 20 to 60 years of either gender were included. Patients with traumatic spinal cord injury or who have not given consent were excluded. After explaining the study protocol to each patient, their informed consent was obtained. The data was collected using a proforma (annexed) created especially for the study. Expert neurologists assessed each patient. The diagnosis was made using a combination of the patient's medical history, a neurological examination, and the necessary investigation. Using laboratory and radiographic data, the diagnosis was verified (X-Rays, CT-scan, and MRI). SPSS version 21.0 was used for the statistical analysis. The frequency and percentages were calculated for gender, paraparesis or quadriparesis, residence (urban or rural) and etiological factors of non-traumatic compressive myelopathy. Quantitative factors including age and the length of the disease were calculated using the Mean and Standard Deviation (SD). By stratification, effect modifiers like age, duration, gender, paraparesis/quadriparesis, and residence were managed. The outcome variable was subjec-

ted to the post-stratification chi-square test with a 95% confidence interval, and a p-value of 0.05 was deemed statistically significant.

Results

The results of this study, which comprised 163 individuals, were examined to determine the causes of non-traumatic compressive myelopathy and individual etiological factors were analysed separately. Out of 163 patients, 106 (65%) were male while 57 (35%) were female and Male to Female ratio was 1.85. The age of study population ranged from 20-60 years. Mean age of the patients were 47.6 years. Mean duration of disease was 6.8 weeks. Out of 163 patients, 95 (58.3%) patients belonged to urban areas while 68 (41.7%) were from rural areas as shown in Table 1.

In distribution of para paresis or quadriparesis, 111(68.1%) patients had Para paresis, while 52 (31.9%) had quadriparesis as shown in Figure 01. Among 163 patients frequency of various etiological factors observed as disc prolapse 22(13.5%), cervical Spondylosis 10(6.1%), Pott’s disease 15 (9.2%), tuberculosis spinal arachnoiditis 35(21.5%), spinal secondaries 24(14.8%), spinal epidural abscess 8(4.9%), multiple myeloma 12(7.3%), Demyelinating myelitis 30(18.4%), idiopathic or viral transverse myelitis 4(2.5%) while ossification of the posterior longitudinal ligament was 3(1.8%) patients as shown in Table 2.

When we used the Chi-square test to assess the stratification of age group, gender, and paraparesis/quadriparesis with respect to the etiological factors of non-traumatic compressive myelopathy, we obtained P. Values (0.981), (0.858), & (0.929) that are respectively more than the level (.05), therefore we came to the conclusion that there was no significant difference on the basis of age group, gender, and paraparesis as shown in Table 3 to 6.

Table 1. Basic Demographic Characteristics of Study Group

	N	%
Total patients enrolled	163	
AGE		
Minimum	20	
Maximum	60	
Mean ± SD	47.6 ± 11.2	
Gender Distribution		
Male	106	65
Female	57	35
Duration of Disease (weeks)		
Minimum	1	
Maximum	16	
Mean	6.8	
Standard Deviation	4.1	
Referral type		
Rural	68	41.7
Urban	95	58.3
Etiological Factor	Frequency	Percentage

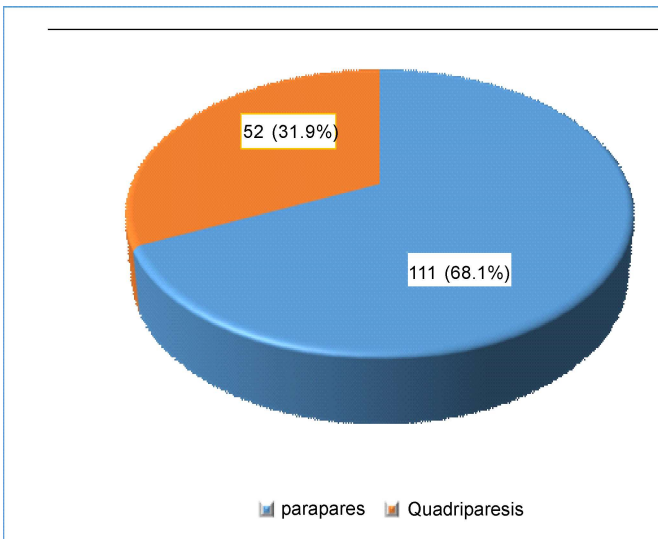


Fig 1. Frequency of Paraparesis or Quadriparesis n=163

Table 2: Frequency of Etiological Factors

Disc. Prolapse	22	13.5
Cervical Spondylosis	10	6.1
Pott’s Disease	15	9.2
Tuberculosis Spinal Arachnoiditis	35	21.5
Spinal Secondaries	24	14.8
Spinal Epidural Abscess	8	4.9
Multiple Myeloma	12	7.3
Demyelinating Myelitis	30	18.4
Idiopathic Myelitis	4	2.5
Ossification of the posterior longitudinal ligament.	3	1.8

Table 3. Stratification of age group with etiological factors

Etiological Factors	Age Group[In Years]		P-VALUE
	20-45	>45	
Disc. Prolapsed	8 (4.9%)	14 (8.6%)	0.981
Cervical Spondylosis	4 (2.5%)	6 (3.7%)	
Pott's Disease	5 (3.1%)	10 (6.1%)	
Tuberculosis Spinal	13 (8.0%)	22 (13.5%)	
Arachnoiditis			
Spinal Secondaries	9 (5.5%)	15 (9.2%)	
Spinal EpiduralAbscess	3 (1.8%)	5 (3.1%)	
Multiple Myeloma	4 (2.5%)	8 (4.9%)	
Demyelinating Myelitis	7 (4.3%)	23 (14.1%)	
Transverse Myelitis	2 (1.2%)	2 (1.2%)	
OPLL	1 (0.6%)	2 (1.2%)	

Table 4. Stratification of gender with etiological factors

Etiological Factors	Gender		P-Value
	Male	Female	
Disc. Prolapsed	14 (8.6%)	8 (4.9%)	0.858
Cervical Spondylosis	7 (4.3%)	3 (1.8%)	
Pott's Disease	10 (6.1%)	5 (3.1%)	
Tuberculosis Spinal	19 (11.7%)	16 (9.8%)	
Arachnoiditis			
Spinal Secondaries	15 (9.2%)	9 (5.5%)	
Spinal Epidural Abscess	5 (3.1%)	3 (1.8%)	
Multiple Myeloma	8 (4.9%)	4 (2.5%)	
Demyelinating Myelitis	22 (13.5%)	8 (4.9%)	
Idiopathic Transverse Myelitis	3 (1.8%)	1 (0.6%)	
OPLL	3 (1.8%)	0 (0.0%)	

*Applied Chi-Square test

Table 5. Stratification of paraparesis or quadriparesis with etiological factors

Etiological Factors	Paraparesis/Quadriparesis		P-VALUE
	Paraparesis	Quadriparesis	
Disc. Prolapsed	15 (9.2%)	7 (4.3%)	0.929
Cervical Spondylosis	6 (3.7%)	4 (2.5%)	
Pott's Disease	9 (5.5%)	6 (3.7%)	
Tuberculous Spinal	27 (16.6%)	8 (4.9%)	
Arachnoiditis			
Spinal Secondaries	16 (9.8%)	8 (4.9%)	
Spinal EpiduralAbscess	5 (3.1%)	3 (1.8%)	
Multiple Myeloma	7 (4.3%)	5 (3.1%)	
Demyelinating Myelitis	22 (13.5%)	8 (4.9%)	
Transverse Myelitis	2 (1.2%)	2 (1.2%)	
OPLL	2 (1.2%)	1 (0.6%)	

Applied Chi-Squaretest

Discussion

Myelopathy describes any neurologic deficit related to spinal cord injury (SCI). Lesions and pathological processes of spinal cord results in neurological impairment affecting motor, sensory, and autonomic functions. Myelopathy in other terms is set of signs and symptoms produced due to spinal

cord compression, it is further divided according to site of spinal cord injury in three types, 1. Cervical myelopathy when damage occurs at cervical level of spinal cord, 2.dorsal myelopathy when spinal cord is damaged at the level of thoracic spine. 3. Lumbar myelopathy particularly involves proximal part of lumbar spine while damages to distal portion of lumbar spine does not give rise the sign and symptoms of myelopathy because it does not contain spinal cord. Distal part of lumbar spine is collection of nerve roots damage to this area lead to radiculopathic features rather than myelopathic features.

Myelopathy in the absence of trauma is a medical emergency for which early medical intervention is essential to lessen the development of neurological deficits. Myelopathy has high morbidity and mortality. Mortality risk varies widely by country and income status and depends on the availability of quality clinical care and rehabilitation services. About 79% of patients with myelopathy remain disabled even after rehabilitation¹⁵.

Mean age for spinal myelopathy in our study was 47.2 ± 11.2 years which is comparable to other study¹⁶. A study of Malik A, et al¹⁷ & Pinto WB, et al¹⁸ reported mean age 46.8 ± 11.6 & 48.5 ± 16.2 years respectively. While Hemamalini G, et al¹⁴ reported mean age as 43 years which is lower as compared to our study.

In our study, out of 163 patients, 106 (65%) were male while 57(35%) were female. In the study of Malik A, et al¹⁷, out of 150 patients, 99 patients were male while 51 patients were female. Like in our study similar male dominance was also observed in studies by Kayal AK et al¹⁹, and Onwuche-kwa RC, et al²⁰. However Hemamalini G, et al¹⁴ reported equal gender distribution as 25 (50%) male and 25 (50%) female as opposite in our study.

In our study majority of patients presented with paraparesis 111 (68.1%) whereas 52 (31.9%) had quadriparesis. Similar pattern of Paraparsis predominancy also shown by studies from Hemamalini G, et al¹⁴ & Malik A, et al¹⁷ respectively. Kayal AK, et al¹⁹ reported quadriparesis in 81 (56%) and

paraparesis in 58 (38.4%) patients which is opposite pattern from our study.

In present study, among the non-traumatic compressive myelopathy the most common etiological factor was Tuberculosis spine followed by Demyelinating myelitis.

The studies from Deivigan P, et al²¹ & Haque MN, et al²² reported Tuberculosis of Spine followed by Myelitis were most common causes among Non-traumatic myelopathies representing same etiologic patterns as in our study.

In our study, stratification of confounders /effect modifiers with respect to etiological factors of non-traumatic compressive myelopathy, insignificant difference was noted in age group (P=0.981), gender (P=0.858) and paraparesis or quadriplegia (P=0.929).

Our study is one of the few studies in the region looking at non-traumatic causes of spinal cord pathologies. It gives an idea of the incidence of these etiologies in our population. Paraplegia and quadriplegia are severely debilitating conditions with massive burden on the health economy. It is therefore important to identify the common etiologies and to better allocate resources. Tuberculosis of the spine is the most frequent albeit preventable cause of non-traumatic myelopathy in our country.

Conclusion

It is to be concluded that tuberculosis spinal arachnoiditis was the most common etiology followed by multiple sclerosis among non-traumatic compressive myelopathy patients. It is imperative to identify the underlying risk factors to address the burden of diseases and to optimize the management strategies for these already compromised patients. Furthermore, our findings outline the need for future research to investigate those factors that could be considered as higher risk of non-traumatic compressive myelopathies.

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