

Magnetic Resonance Imaging-Based Evaluation of the Etiology of Non-Traumatic Myelopathies in Bangladesh: A Hospital-based Observational Cross-sectional Study from Two Tertiary Care Centers of Dhaka

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Abstract

Background: Non-traumatic myelopathies has several etiologies. **Objectives:** The aim of the study was to see the etiology of non-traumatic myelopathy based on magnetic resonance imaging (MRI) changes in the context of Bangladesh. **Methodology:** Patients clinically diagnosed as non-traumatic myelopathy in the department of neurology of Sir Salimullah Medical College and Hospital (SSMCH), and in the inpatient wards of the National Institute of Neurosciences (NINS), considering the inclusion and exclusion criteria were enrolled as the study population from May 2014 to December 2015. Age, gender, clinical presentations and type of lesion based on MRI changes were collected. All the data were analyzed statistically. **Results:** Total 100 cases satisfied the inclusion and exclusion criteria in this study. Among them, there were 62 males and 38 females with a male to female ratio of 1.63:1. The mean age was found to be (mean \pm SD) 45.80 \pm 15.28 with age ranges from 15 to 74 years. The highest number of patients (26.0%) was in the age group 51-60 years, followed by 24% patients in the age group 31-40 years. Based on MRI scan, most common etiologies that commonly diagnosed are cervical spondylotic myelopathy (31%), transverse myelitis (26%), primary spinal tumour (13%), spinal tuberculosis (12%), spinal metastatic disease (12%), and unclassified (6%). MRI scan also detect the common sites of involvements of these causes. **Conclusion:** In this study cervical spondylotic myelopathy, transverse myelitis, and spinal tuberculosis are the most common cause of non-traumatic myelopathy in the context of Bangladesh. [*Journal of National Institute of Neurosciences Bangladesh, 2018;4(2):87-91*]

Keywords: Etiology; Non-traumatic Myelopathy; Magnetic Resonance Imaging; Cervical Spondylotic Myelopathy; Transverse Myelitis; Spinal Tuberculosis; Spinal Metastatic Disease; Spinal Tumour

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Introduction

Myelopathy is a common neurological disease affecting motor, sensory and autonomic functions resulting from

damage or dysfunction of the spinal cord, meningeal or perimeningeal space with high morbidity and mortality¹. The clinical presentations of nontraumatic myelopathies

are diverse ranges from paraplegia to quadriplegia with or without involvement of bowel and bladder². The outcome of the disease depends on the underlying disease process, country, and income status, availability of quality imaging and rehabilitation services³. Globally, there is no statistical data regarding the actual number of people living with myelopathy and most of the studies are based on traumatic myelopathy⁴. Non-traumatic myelopathy may be compressive or noncompressive⁵. The main causes of extra medullary and extradural compressive myelopathies are Pott's disease, degenerative disc diseases such as spondylosis with disk herniation and metastatic tumors⁶. On the other hand spinal cord tumors, such as meningiomas, neurofibromas, and schwannomas are the most common causes of extramedullary but intradural cord compression⁶. Disorders that present as non-compressive myelopathy are due to demyelination, infections, inflammatory, nutritional, toxic, vascular, hereditary, metabolic, irradiation and paraneoplastic^{7,8}. Magnetic Resonance Imaging (MRI) of the spine is a powerful tool for the evaluation, assessment of severity, and follow-up of diseases⁹.

In Bangladesh, no data exist on the non-traumatic myelopathies based on findings in MRI. The aim is to evaluate the etiology of non-traumatic myelopathy based on MRI to find out the most common causes and its clinical presentation in the context of Bangladesh.

Methodology

This was Hospital-based observational cross-sectional study carried out in the Department of Neurology of Sir Salimullah Medical College and Hospital (SSMCH), and in the inpatient wards of the National Institute of Neurosciences (NINS), Agargaon, Dhaka in the period of May 2014 to December 2015. All 100 patients clinically diagnosed as non-traumatic myelopathy considering the inclusion and exclusion criteria were enrolled as the study population.

Results

In this study, total 100 patients were evaluated, 62 males and 38 females with a male to female ratio 1.63:1 (Table 1)

Table 1: Distribution of the study population by sex (n= 100)

Gender	Frequency	Percent
Male	62	62.0
Female	38	38.0
Total	100	100.00

The mean age was (mean \pm SD) 45.80 \pm 15.28 with age ranges from 15 to 74 years. The highest number of patients (26.0%) was in the age group 51-60 years, followed by 24% patients in the age group 31-40 years (Table 2).

Table 2: Distribution of study population by age (n=100)

Age Group	Frequency	Percentage
12 to 20 Years	7	7.0
21 to 30 Years	16	16.0
31 to 40 Years	24	24.0
41 to 50 Years	16	16.0
51 to 60 Years	26	26.0
More than 61 Years	11	11.0
Total	100	100.0

Mean \pm SD (Range): 45.80 \pm 15.28 (15 to 74)

MRI scan has been found that among 100 cases of nontraumatic myelopathy the most common cause was cervical spondylotic myelopathy (31%) followed by transverse myelitis (26%) and 12% patients were found to be spinal tuberculosis. Others etiology of non-traumatic myelopathy was a primary spinal tumour (13%), spinal metastasis (12%), and unclassified (6%) based on MRI scan. Here it is necessary to point out that those who presented with paraplegia with or without bladder symptoms with no changes in MRI scan are stated as unclassified (Table 3).

Table 3: Distribution of the study population by etiological profile based on MRI changes

Etiological Profile	Frequency	Percentage
Cervical Spondylotic Myelopathy	31	31.0
Transverse Myelitis	26	26.0
Primary Spinal Tumor	13	13.0
Spinal TB	12	12.0
Spinal Metastatic Disease	12	12.0
Unclassified	06	6.0
Total	100	100.0

The study also observed that in cervical spondylosis 31(100%) patients presented with quadriplegia and most patients had sensory symptoms (90.3%) and 16(51.5%) had involvement of bowel and bladder. Out of 26 patients with transverse myelitis, 24(92.3%) presented with paraplegia and 2(7.7%) presented with quadriplegia, 77% had sensory symptoms and 60% had bowel and bladder involvement. Among the 13 cases of primary spinal tumour, 11(84.61%) presented with

Table 4: Etiological Diagnosis and Clinical Profile

Etiological Profile	Clinical Profile			
	Paraplegia/ Paraparesis	Quadriplegia/ Quadriparesis	Sensory Symptoms	Bowel & Bladder
Cervical Spondylotic Myelopathy	0(0.0%)	31(100.0%)	28 (90.3%)	16 (51.6%)
Transverse Myelopathy	24(92.3%)	2(7.7%)	20 (77.0%)	15 (60.0%)
Primary Spinal Tumour	11(84.61%)	2(15.4%)	10(76.9%)	08 (61.5%)
Spinal TB	11(91.7%)	1(8.3%)	10 (84.0%)	06 (50.0%)
Spinal Metastasis	11(91.7%)	1 (8.3%)	11(91.7%)	11(91.7%)
Unclassified	6(100.0%)	0(0.0%)	0 (0.0%)	2 (33.3%)

Table 5: Level of Involvement

Etiological Profile	Level of involvements	Percent
Cervical Spondylotic Myelopathy	Most common level of involvement C4/C5-C5/C6 vertebra	75.0
Transverse Myelitis	Most commonly involved dorsal spinal segments	92.0
Primary Spinal Tumor	No definite level.	
Spinal TB	Spinal TB mostly affected dorsal vertebral bodied	91.7
Spinal Metastatic Disease	Common site thoracic vertebral body	91.7

paraplegia or paraparesis, 10(76.92%) having sensory symptoms and 8(61.53%) with bowel and bladder involvement. In spinal tuberculosis 11(91.7%) had paraplegia and only 1(8.3%) presented with quadriplegia, 84.0% patient had sensory symptoms and 60% had bowel and bladder involvement. Spinal metastasis comprise 12.0% of non-traumatic myelopathy, among which 11(91.7%) had paraplegia and only 1(8.3%) had quadriplegia with 11(91.7%) patients had both bowel and bladder involvements (Table 4).

The most common site of involvements for cervical spondylotic myelopathy are cervical C4/C5 and C5/C6 whereas for transverse myelitis the common site of involvement was dorsal spinal segments and spinal TB mostly affected dorsal vertebral bodies. In case of spinal metastasis thoracic vertebrae showed more involvements however, both spinal extramedullary and intramedullary tumor had no definite level of involvements (Table 5).

Discussion

Globally, myelopathy associated morbidity and mortality is high⁵. Among the myelopathies, non-traumatic myelopathies associated morbidity and mortality is preventable if it is diagnosed early in the disease process².

In 2013, World Health Organization (WHO) reported that the incidence of non-traumatic myelopathies is higher in male than females and incidence steadily increases with age⁴. This study showed the similar results among the 100 cases, 62% were male and 38%

were female and highest number of patients (26%) fall in the age group 51 to 60 years of age. Male predominance may be due to the culture of our society where male are more likely involved in high-risk and strenuous jobs. The mean age in this study was 45.80 years, which are similar to other studies⁷⁻⁸.

Moore et al studied 585 patients in the UK with non-traumatic myelopathies, common etiologies were - cervical spondylosis (23.6%), multiple sclerosis (17.8%), neoplasia (16.4%), and idiopathic or unknown aetiology (18.6%)¹⁰. Prabhaka et al studied 57 patients with non-compressive myelopathy in Chandigarh, India and reported that acute transverse myelitis was the commonest cause (54.38%) followed by vitamin B₁₂ deficiency myelopathy (57%), primary progressive multiple sclerosis (8.77%) and unclassified (7.01%)⁷. Chaurasia et al⁸ had found that out of 204 patients, 126 (62%) had compressive non-traumatic myelopathy and rest were suffering from non-compressive myelopathy. Among the 126 patients, most common etiologies are given in an order of spinal TB (35.7%), cervical spondylosis (34%) and spinal tumour (19.8%)⁸. Transverse myelitis forms the major bulk (45.0%) of non-compressive myelopathy in that study⁸. Primary spinal tumor which includes both intra and extra-medullary tumors and excluding spinal metastasis (12%) found in 13% cases in this study. Spinal TB involved 12.0% of cases were placed as a 4th common cause despite the big burden of tuberculosis in Bangladesh. Spinal metastasis also involved in 12.0% of cases in this study. Interestingly, in this study, 6.0% patients were identified as unclassified as no cause and

no change was found in MRI of the spine, which is much lower than that of the previous studies^{4,11-12}.

Machino et al had found impairment of motor functions in the upper and lower extremities 77.7% and 88.4% respectively, sensory impairment in the upper and lower extremities and trunk in 88.6%, 56.5% and 48.3% respectively¹⁵. Fukuda et al¹⁴ revealed 53.7% cases complained of lower urinary tract symptoms and 20.0% had a neurogenic bladder in pure CSM. In this study, all patients of CSM presented with quadriplegia or quadriparesis (100%), 90.3% cases had some sort of sensory symptoms and 51.6% had involvement of bowel and bladder. This result is almost similar with the result of previous studies^{6, 13-15}.

Among the 35 cases of acute transverse myelitis studied by Chaurasia et al⁸ revealed that 17 cases presented with quadriparesis, and 18 cases presented with paraparesis. Gupta et al¹⁶ studied 43 patients of ATM and found that 17 had tetraplegia, 26 had paraplegia and 36 had bladder involvement. Huh et al¹⁷ found motor deficit in 33 patients (71.7%), sensory deficit in 45 patients (97.8%), urinary dysfunction in 25(54.3%) patients and bowel dysfunction in 9 cases (19.6%). In this study, among the 26 cases of acute transverse myelitis, 24(92.3%) cases presented with paraplegia or paraparesis, 20(77%) cases had a specific sensory level and bowel & bladder involved in 15(60%) cases. This is almost similar to the previous studies.

In this study, 13 cases of the primary spinal tumour were found. Özkan et al¹⁸ studied 50 patients with intradural spinal cord tumours and found 6 cases presented with paraparesis, 13 cases with monoparesis legs and 9 cases with monoparesis arms. Among them, 12 cases were having sensory disturbance and 6 cases having bladder and bowel dysfunction¹⁸. In this present study, 11(84.61%) cases presented with paraplegia or paraparesis, 10(76.92%) cases with sensory symptoms and 8(61.53%) cases with bowel and bladder involvement.

In spinal tuberculosis, Chaurasia et al⁸ found that 42 cases out of 45 presented with paraparesis, 3 presented with quadriparesis. In this study 11(91.7%) cases presented with paraplegia. It may be due to the predilection of spinal tuberculosis to the thoracic spine, mostly lower thoracic spine, Kalita et al¹⁹ found that bladder involvement in 15(50%) cases. In this study it has been found similar findings as bowel and bladder involved in 50.0% cases in this study. Sensory symptoms were noted in 84.0% cases in this present study.

Spinal metastasis also causes cord compression; Chaurasia et al⁸ found 4 cases of spinal metastasis in whom 3 presented with paraplegia or paraparesis. In this present study, total 12 cases of spinal metastasis case were found. Milross et al studied 98 cases of spinal metastasis and found 61(64.89%) cases had a sensory disturbance, bladder dysfunction in 42(44.68%) cases and bowel dysfunction in 36(38.29%) cases²⁰. In this study among 13 cases of spinal metastasis, 11(91.7%) patient had sensory symptoms and involvement of both bowel and bladder. This result is much higher than the previous studies. This may be because of selection criteria, diagnosis far too late and less awareness of cancer metastasis. In the case of unclassified 6 cases, all presented with paraplegia or paraparesis with 2 cases having bladder and bowel involvement.

Characteristic changes of MRI in cervical myelopathy include spinal canal stenosis and cord compression as a result of osteophytes overgrowth, disc herniation and ligamentum hypertrophy²¹. Nagata et al²² had studied 173 patients with cervical myelopathy where the most frequent levels of involvement were C4/C5 and C5/C6 in young group (34-64 years) and in old group (65-85 years), most frequent levels were C3/C4, C4/C5, C5/C6²². In this study it was observed that cervical spondylitis is the major cause of nontraumatic myelopathy which was about 31% and all most all patients were present with quadriplegia, and most common site of involvement seen at C4-C5 level and C5-C6 level. This finding has been consistently demonstrated in most of the previous studies.

Sneller et al²³ reviewed a 9-year retrospective study of 63 patients diagnosed as acute transverse myelitis. MRI hyperintense signal changes suggestive of myelitis was present in 57(90.4%) patients. MRI lesions were detected within the cervical cord (47.4%), thoracic cord (24.6%), or both in cervical and thoracic cord (28.1%). In this study, transverse myelitis was the second most important cause of nontraumatic noncompressive myelopathy and majority of patients 92.3% presented with paraplegia and MRI showed swollen cord with few segments. The most common level was thoracic level (92%) followed by cervical region (8%).

Regarding spinal TB one recent study by Yasratnein et al²⁴ revealed that MRI can detect early vertebral lesions in spinal tuberculosis. In this study, spinal TB comprises 12.0% of all patients. MRI suggested most common sites of involvement were at Dorsal (D7) to Dorsal (D10) which was about 92.0% along with the

paravertebral soft tissue component. Mir et al²⁵ studied 46 patients of metastatic spinal cord compression found that, the thoracic column region was the commonest region involved by metastatic lesions, accounting for 29(63.04%) patients. In another study by Ravi et al²⁶ on 35 spinal tumors revealed that 10(28.5%) cases were localized into extradural, 17(48.5%) cases into intradural and extra-medullary and 8(23%) cases into intramedullary compartments. In this study, about 11 cases out of 12 of spinal metastatic lesions were found to be involved the thoracic spinal column. In this study, 6(28.5%) cases of spinal tumor were found in intradural and extra-medullary and 7 cases were found as intradural and intramedullary. However, no definite level of involvement was identified.

There was some limitation of this study, includes the small sample size, short duration of the study period. It is a hospital-based study which doesn't reflect the actual picture of the whole population, makes another limitation of this study.

Conclusion

This study is focused on the etiology of non-traumatic myelopathies in the perspective of Bangladesh. In this study it has been found that cervical spondylotic myelopathy, transverse myelitis, and tuberculosis are found as a common cause. MRI scans of the spine helps to detect the site and pattern of involvements and thereby gives an idea regarding the etiology and treatment strategy.

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