

# Central Neuropathic Pain after Acute Spinal Cord Injury (NP in SCI): A Case series of 494 SCI cases

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**Abstract** —Pain following Spinal Cord Injury (SCI) is very common. So this study was conducted to find out prevalence, associated factors and pattern of Neuropathic Pain (NP) among SCI patients, for which 494 consecutive eligible patients of Spinal Cord Injury (SCI) admitted in the Department were evaluated for NP. It was observed that 13.76% of SCI patients complained of neuropathic pain. In 21 to 30 years age group 23.13% and 61.76% cases of neuropathic pain had dorso-lumbar injury. 48.30% cases of neuropathic pain had onset in 2<sup>nd</sup> and 3<sup>rd</sup> week. Discomfort was more at night (36.76%), in below the knee area and dorsum of the foot. Hot burning type of sensation was the commonest descriptor of NP and range of movement (ROM) exercises and tepid cold water sponging were relieving factors.

**Keywords:** Spinal cord injury, Neuropathic pain.

## I. INTRODUCTION

Pain following Spinal Cord Injury (SCI) is a syndrome which includes all the pain types occurring in a spinal cord injury patient. In 1917 Riddoch<sup>1</sup> first addressed the problem in war sufferers and later on it was investigated over the period of time with variable results.

The pathophysiology of neuropathic pain is an area of intense interest and controversy. Initial interest was focused on the role of peripheral nerve injury. It is now clear that the central mechanisms are of importance as well. Peripheral sensitization is caused by the lowering of the threshold to fire, Primary hyperalgesia, Differentiation results from the destruction of nerve fibres & Central sensitization is the result of hyper excitability of spinal-cord neurons in response to repeated peripheral stimulation.<sup>1,2</sup> It is well known that any type of pain perception is altered with emotional and psychological factors, Neuropathic pain after SCI is not an exception here pain intensity and perception can be altered with feeling of helplessness, loneliness, anxiety and depression which are invariably associated with SCI.

Prevalence of post SCI pain is ranging between 18 – 94%<sup>2-8</sup>, with one third of the cases rating their pain as severe<sup>2</sup>. Post SCI pain classified as visceral, musculoskeletal and Neuropathic Pain etc<sup>9</sup>, and neuropathic pain is the most common pain type during inpatient rehabilitation<sup>6</sup> and major component of the total pain experience.<sup>10</sup> Rintala et al<sup>5</sup> estimated 75% of chronic SCI pain and 10.1% of central pain prevalence among community based sample in spinal cord injured males.

## II. METHODOLOGY

The study was conducted at Department of Physical Medicine and Rehabilitation, S.M.S Medical College, Jaipur, India between October 2006 to September 2007 to assess the prevalence, associated factors and pattern of Neuropathic Pain (NP) among acute SCI patients.

Minimum sample size 366 spinal cord injury patients was needed at 95% confidence level & 5% precision assuming 61% incidence of neuropathic pain in as found in Demirel et al study<sup>4</sup>.

Detailed systemic & neurological examination was performed and daily counseling for pain was done. A patient was diagnosed as neuropathic pain according to definition of International Association for the Study of Pain (IASP)<sup>9</sup> was enrolled in the study with his informed written consent and all his/her characteristics pertaining to NP like onset time, direction, distribution, nature, frequency, diurnal variation, relieving and aggravating factors along with socio-demographic variables were noted in a pre prepared proforma. The pain intensity was assessed on 10 point Visual Analog Scale (VAS).

Data thus collected were summarized as mean & standard deviation and in case of quantitative data and in case of qualitative data as percentages (%). It was analyzed by using chi- square test for nominal/ categorical variables and by unpaired 't' test for linear variables. 'p' value of < 0.05 was taken as significant. SPSS 17 version software was used for all statistical calculations.

### III. RESULTS

Present study was initiated in 578 SCI patients comprising 500 males and 78 females. 80 males and 4 females were dropped out because of different reasons like death, left against medical advice, absconded and transferred to other departments, leaving 494 patients in study. 68 (13.76%) cases developed NP during first stay out of them 26 (38.24%) were having injury in cervical region and 42 (61.76%) in dorso-lumber region.

Highest proportion of NP was found in between age of 21 years to 30 years (23.13%) and least in >50 year age group (3.70). Statistically, age was found significantly associated with incidence of NP ('p' value<0.001). Females were having slightly more NP (14.86%) than males (13.57%), however, this difference was not found statistically significant ('p' value=0.909). (Table 1)

**Table 1**  
**Neuropathic Pain (NP) among spinal cord injury cases as per Age & Sex**

S. No.	Age Group	Total SCI Cases	Cases with NP	Proportion of cases with NP	'p' Value*
1	<i>Up to 20</i>	59	7	11.86	<0.001
	<i>21- 30</i>	147	34	23.13	
	<i>31 – 40</i>	140	16	11.43	
	<i>41 – 50</i>	67	8	11.94	
	<i>&gt; 50</i>	81	3	3.70	
2	<b>Sex</b>				0.909
	<i>Male</i>	420	57	13.57	
	<i>Female</i>	74	11	14.86	
	<b>Total</b>	<b>494</b>	<b>68</b>	<b>13.77</b>	

*\*Chi-square test*

Average onset time for NP was 29.53±32.19 days, ranging from 3 days to 158 days (Median; 19 days). 48 cases (70.58%) had onset of NP within first 4 weeks, with a higher incidence during 2<sup>nd</sup> & 3<sup>rd</sup> week. (Table 2)

**Table 2**  
**Time of onset of wise distribution of spinal cord injury cases with Neuropathic Pain (NP)**

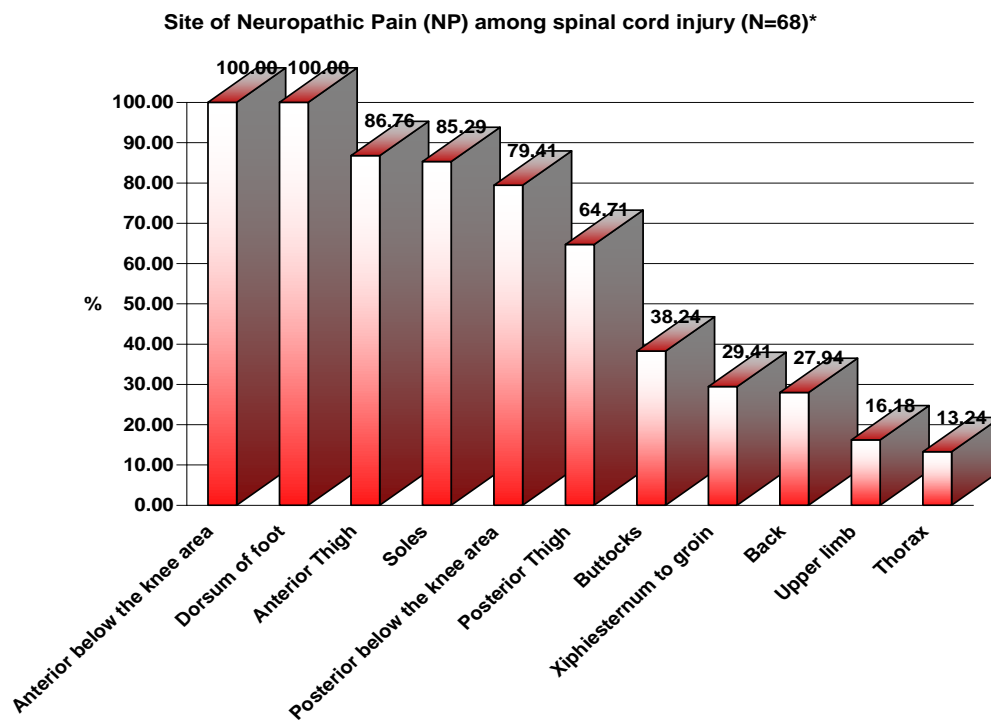
Time of onset of NP	Total SCI Cases with NP	Percentage of SCI Cases with NP
0 day	1	1.47
1 week	11	16.18
2 weeks	16	23.53
3 weeks	17	25.00
4 weeks	3	4.41
5 weeks	5	7.35
6 weeks	4	5.88
7 weeks	3	4.41
8 weeks	1	1.47
9 weeks	2	2.94
>9 weeks	5	7.35
<b>Total</b>	<b>68</b>	<b>100</b>

Majority of cases of NP (57.35%) described their discomfort as a hot burning sensation, 13.23% described as burning chilly sensation and remaining 29.41% as mixed sensations. (Table 3)

**Table 3**  
**Time of onset of wise distribution of spinal cord injury cases with Neuropathic Pain (NP)**

Verbal descriptors of Pain	Total SCI Cases with NP	Percentage of SCI Cases with NP
Hot burning	39	57.35
Burning chilly sensation	9	13.24
Creeping sensation	2	2.94
Electric Shock	2	2.94
Hot and burning chilly sensation	2	2.94
Hot burning and pins and pricks	2	2.94
Burning chilly and creeping sensation	1	1.47
Crushing pain	1	1.47
Hot burning and Creeping	1	1.47
Hot burning and Cutting	1	1.47
Hot burning and electric shock like sensation	1	1.47
Hot burning and rush of blood	1	1.47
Hot burning and Tingling	1	1.47
Hot burning, and throbbing pain	1	1.47
Hot burning with Sensation of Vibrations	1	1.47
Throbbing Pain	1	1.47
Tingling Sensation and Cold	1	1.47
Hot burning, Electric shock & Pins and pricks	1	1.47
<b>Total</b>	<b>68</b>	<b>100</b>

All the patients of NP had pain in anterior below the knee area & dorsum of foot (100%). Anterior Thigh, soles & posterior below the knee area were affected area in 86.76%, 85.29% & 79.41% patents respectively. Upper limb & thorax were least affected area in 16.18% & 13.24% patients only. (Figure 1)

**Figure 1**

*\*Multiple responses*

Nights were more discomforting for 38.23% cases while 32.35% were facing more pain in day time. Remaining cases were not experiencing any diurnal variation.

NP of 25% cases was found to be relieved by range of motion exercises (ROM Ex.) and tepid sponging and equal percentage of cases had no relieving factor.

#### IV. DISCUSSION

SCI results in severe disability but associated neuropathic pain following SCI makes it worse. Irrespective of the sex and site of injury, the incidence was highest in 21 to 30 years age group in total SCI cases. Higher incidence of neuropathic pain was found among male cervical cases which can be justified by the fact that they are the earning member of the family and loss of limb functions with increased feeling of helplessness could be a compounding reason for higher level of anxiety and depression, leading to increased perception of abnormal sensations.

Incidence of neuropathic pain in elderly patients is low contrary to Demirel et al<sup>4</sup>, as majority of patients in present study were from joint family and probably getting emotional support and family care to combat against associated trauma related anxiety & depression.

Present study is similar to studies of Demirel et al<sup>4</sup> and Nepomuceno et al<sup>7</sup> as dorso-lumbar segment was found to be more commonly involved than cervical one, in all the three studies. Time since injury doesn't carry any relation with onset of pain<sup>4</sup>.

This study found highest proportion of cases with neuropathic pain in 3<sup>rd</sup> week followed by 2<sup>nd</sup> week post trauma and more than 70% cases experienced pain during first 4 weeks corroborative with Widerstorm et al<sup>8</sup>.

Nepomuceno et al<sup>7</sup> found that lower limbs involved more in lower dorsal and lumbo-sacral injuries, upper limbs in cervical injuries, and trunk more common in high dorsal injuries. Widerstorm et al<sup>8</sup> found buttocks, followed by legs, feet and thighs to be commonly affected areas for hot burning sensation. Present study also found that lower extremity affected more and dorsum of foot was most common area in both cervical and dorsolumbar injuries.

In most studies<sup>7,8,11</sup> majority of SCI cases described their discomfort as burning. This study also found that hot burning sensation was the commonest verbal descriptor used by 57.35% cases and burning chilly sensation by 13.23% cases.

These patients feel more pain during night time<sup>4</sup>. 10 (14.70%) cases of the cervical injury and 16 (23.52%) cases of the dorsolumbar injury found their discomfort more during the night time. This is probably due to the fact that during day time patients have many people around them and they have no time to think of their own problem, but during night time when all members of the family are sleeping and at this time they think of themselves and feels more intense pain.

Present study observed that 16.17% of the cervical injury cases and 8.82% of the dorsolumbar injury cases got relief in neuropathic pain by range of movement exercises and tepid sponging etc. Despite of extensive print and electronic literature search, publications regarding effect of physical modalities in relieving neuropathic pain could not be found to discuss.

## V. CONCLUSION

Neuropathic pain is found in 13.76% of SCI patients and age is significantly associated factor. It is most frequently described as hot burning type of sensation and is commonly present in dorso-lumber SCI with high incidence in 21-30 year age group. Below knee area and dorsum of foot are commonest areas of discomfort and nights are more distressing it is relieved by physical modalities in most of the patients.

## CONFLICT OF INTEREST

None declared till now.

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