Original Article

INCIDENCE OF MUSCULOSKELETAL PAIN AND ITS IMPACT ON DAILY & FUNCTIONAL ACTIVITIES AMONG INDIAN SPINAL CORD INJURY PATIENTS

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ABSTRACT

Background: Pain is a common complication after spinal cord injury which can significantly impact upon a person's functional ability and independence, ability to return to work and quality of life. Spinal cord injury patients suffer from several types of pain such as musculoskeletal pain, visceral pain, Neuropathic pain. Musculoskeletal pain generally arises from bones, joints, ligaments and muscles either in the acute post-injury phase or with chronic overuse in spinal cord injury patients. **Purpose:** The purpose of present study is to find out the incidence of musculoskeletal pain and its impact on daily and functional activities in Indian spinal cord injury patients. **Materials and Methods:** Hundred spinal cord injured patients were recruited for the study. Patients were asked to report any musculoskeletal pain and intensity of pain was measured by numerical rating scale. Impact on daily activities due to musculoskeletal pain was calculated by individual items score as well as total score of modified Brief pain inventory. Impact on functional activities was calculated by spinal cord independence measure. **Results:** Incidence of musculoskeletal pain was found to be 68%. Musculoskeletal pain intensity measured in numerical rating scale was found to be significantly correlated with impact on daily activities measured by total modified Brief pain inventory score as well as different items score of modified brief pain inventory ($P< 0.001$). Intensity of musculoskeletal pain was also significantly correlated with impact on functional activities measured by spinal cord independence measure score ($P< 0.001$) **Conclusion:** The data revived from the study showed that there is significant impact on daily activities as well as functional activities due to musculoskeletal pain activities in spinal cord injury patients. The clinical implication of the study will be to develop therapeutic measures to prevent or treat musculoskeletal pain after spinal cord injury.

KEY WORDS: MUSCULOSKELETAL PAIN; IMPACT; DAILY & FUNCTIONAL ACTIVITIES; SPINAL CORD INJURY.

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INTRODUCTION

Spinal cord injury (SCI) is an insult to the spinal cord resulting in a change, either temporary or permanent, in its normal motor, sensory, or autonomic function.[1,2] The estimated incidence of SCI worldwide is between 11 and 53 cases per million inhabitants.[3] A study conducted on spinal cord injury patients in united kingdom underlined that the major causes of the approximately one-thousand new traumatic cases of spinal cord injury per year are road traffic accidents, sporting injuries and accidents at home. Whereas the non-traumatic cases are mainly result of transverse myelitis, tumors, vascular accidents.[4]

Pain is a debilitating accompaniment of SCI that imposes a major burden on patients who have already suffered substantial emotional and phy-

sical trauma. Although loss of function is considered the most significant consequence of SCI, pain has a direct bearing on the ability of those with such injuries to regain their optimal level of activity.[5]

Estimates of the prevalence of chronic pain following SCI vary between 11% and 94%. Recent data from the National Model Spinal Cord Injury Systems, United States indicate a pain prevalence ranging from 81%to 82.7%. Studies have shown that persons with SCI commonly develop musculoskeletal pain problems and/ or neuropathic pain at and/or below the level of lesion, both of which can be refractory to treatment .[6]

Pain is a significant problem for many of the patients with SCI, often starting soon after the injury and continuing throughout the life. In addition to central pain due to injury of the central nervous system itself, musculoskeletal pain results from unusual demands on the body (transfers, Wheeling) is commonly reported.[7,8]SCI patients have a higher risk of suffering from musculoskeletal pain in comparison to normal population because of having decreased lean body mass and increased fat mass in comparison to age and sex matched normal population. A SCI patient is on average 13±1% fatter per unit body mass index than age and sex matched normal population.[9]

This coupled with increased demand of muscles and tendons to do activities that are unaccustomed commonly with biomechanics that are compromised for functions, the risk of injury and cumulative trauma are quite profound.[10] With this the spinal cord injured persons has to live with the normal aging process as it affects musculoskeletal system.[11]

Pain is a common and often difficult to treat problem in persons with spinal cord injuries which can be associated with increased physical and psychological dysfunction, independent of the effects of the injury. Pain-related beliefs and coping methods have been shown to influence levels of psychological and physical dysfunction for individuals with chronic pain in general.[12]

A study conducted on SCI patients reported that chronic pain impacts significantly with activities of daily living (ADLs) (20% indicated it impacted a great deal, 30% indicated it impacted “a fair amount”) . 67% of patients with SCI and chronic pain reported that pain had some effect on their daily life, and 23% indicated that their daily routines were markedly or almost completely limited by pain.[13]

There is high degree of variability in the extent to which pain impacts with daily activities in persons with spinal cord injury. To formulate best therapeutic interventions & optimum rehabilitation measures, a definite pattern of incidence & impaction of musculoskeletal pain has to be established. Therefore the purpose of the study is to find out the incidence of musculoskeletal pain and its impact on daily & functional activities in spinal cord injury patients.

MATERIAL AND METHODS

Participants: A sample of 100 spinal cord injury patients were selected by means of convenient sampling from indoor and outpatient department of National institute for the orthopaedically handicapped, Kolkata, west Bengal on the basis of exclusion and inclusion criteria. The subjects with spinal cord injury were included in the study if they fulfilled following criteria: Age should be above 18 years, Both males & females were included, Medical diagnosis of spinal cord injury, Duration since Spinal cord injury at least 6 months Duration, Not having psychological condition that could interfere with constructive participation of patient, Stable vital signs. The subjects are excluded from the study if they had any neurological diagnosis such as brain injury or stroke, History of fracture to pain locations of the body in the last 6 months other than spine, History of recent surgery in the last 6 months to pain locations of the body other than spine, Any diagnosis of reflex sympathetic dystrophy, rheumatoid arthritis, carpal tunnel syndrome in the last 6 months.

Outcome measures

Pain intensity related measure: Patients were asked to identify in which body region they had experienced pain. Pain location was assessed using body chart diagram that asked the patients to tick the affected body part for presence of pain. Pain intensity was measured by Numerical rating scale. Patients were asked to mark the

number that best denote his/her maximum level of pain felt in the last 24 hours with a range between 0-10 with '0' signifying no pain, '1-3' as mild pain, '4-6' as moderate pain and '7-10' as severe pain.[14,15,16,17]

Pain impaction in daily activities: Pain impaction in daily activities was assessed by using Modified brief pain inventory Modified brief pain inventory consists of 7 impaction items such as general activity, ability to get around, mood, Normal work (includes both work outside the home and housework), relations with other people, sleep and enjoyment of life. Each item consists of a grade of 10 with '0'corresponding to "does not interfere" and '10' corresponding to "completely interferes". After that total score of 7 items were calculated to find out modified brief pain inventory score.[14, 18, 19]

Pain impaction in functional activities: Pain impaction in functional activities was assessed by using Spinal cord impendence measure. Spinal cord independence measure is having total score of 0-100. It mainly divided into 3 categories such as self care (0-20), respiration and sphincter management (0-40), mobility activities (0-40). Total score of spinal cord independence measure was calculated by the score of these items.[20]

Procedure:

Aim of the study and procedure were explained to patients and their consent to participate was taken on a duly filled written consent form in English, Hindi or Bengali. For the quadriplegic patients who were unable to sign, thumb impression was taken on the consent form. Ethical clearance had been obtained from the institution for conducting study. The study duration was 12 months & it was a non – interventional interview based survey type of study with written questionnaire. The study was conducted indoor & outdoor department of physiotherapy in National institute for the orthopaedically handicapped, Kolkata, India.

Data was collected regarding pain location (Body chart diagram), Pain intensity (Numerical rating scale), pain impaction in daily activities (Modified brief pain inventory) and pain impaction in functional activities (Spinal cord Independence measure). As per classification of International association for the study of Pain (IASP), musculoskeletal pain can be differentiated from other type's pain in spinal cord injury as dull aching, movement-related, eased by rest, responsive to opioids and NSAIDS, located mainly in musculoskeletal structures. [21, 22]

Reliability

Pain intensity related measure: Numerical rating scale is a reliable, valid instrument to assess pain intensity and recommended over other unidimensional pain measures such as visual analogue scale in spinal cord injury patients. The numerical rating scale can be used as verbally or as a paper and pen version. Using numerical rating scale verbally can have certain advantages in case of quadriplegics who have difficulties with paper & pen version and it would facilitate telephonic interviews/ surveys.[14]

Pain impaction in daily activities: Modified brief pain inventory is a reliable, valid instrument to assess pain impaction in daily activities in spinal cord injury patients. Cronbach alpha for modified brief pain inventory was 0.92, indicating good reliability. Modified brief pain inventory scale can be self or interviewer administered in about 5 minutes.[14]

Pain impaction in functional activities: Spinal cord independence measure is a reliable, valid measure to assess pain impaction in functional activities and recommended over other measures such as functional independence measure in spinal cord injury patients. Outcome measures of spinal cord independence measure were higher than those of functional independence measure for tetraplegia & paraplegia, complete & incomplete lesions. Spinal cord impendence measure is more sensitive to functional changes with respect to functional independence measure.[20]

DATA ANALYSIS

Data was coded, tabulated, computed and evaluated using the Stastical Package for the Social Science version 16.0 (SPSS Inc, Chicago, IL, USA). Test of normality was done using Shapiro-Wilk test, which revealed data were not normally distributed ($p<0.05$). Spearman rank order correlation coefficient was used to test the correlation between musculoskeletal pain intensity (NRS) and musculoskeletal pain

impaction on daily activities (MBPI). Spearman rank order correlation coefficient was also used to test the correlation between musculoskeletal pain intensity (NRS) & musculoskeletal pain impaction in functional activities (SCIM) A statistical significance was taken at $p<0.05$ with 95% confidence interval.

RESULTS

A total of 100 patients with clinical diagnosis of SCI were enrolled in the study among which 68 patients complained of musculoskeletal pain. Mean age at injury and duration since SCI of 100 patients were 33.94±12.56 and 10.39±11.69 (mths) respectively. Most common locations of pain were over shoulder followed by lower back and upper back (Fig 1).Musculoskeletal pain intensity (NRS) was significantly correlated to modified brief pain inventory score (P< 0.001, RHO= .690) (Table 1, Figure 2). Correlations between Musculoskeletal pain intensity (NRS) and different items of modified brief pain inventory were also significant. (P< 0.001) (Table 2). Musculoskeletal pain intensity (NRS) was significantly correlated to spinal cord independence measure score (P< .001, RHO= -.386) (Table 3, Figure 3)

	SPEARMAN CORRELATION	
VARIABLES	P VALUE	RHO VALUE
PAIN INTENSITY(NRS)	0.001	.690**
MODIFIED BPI		

Table 1. Correlation between musculoskeletal pain intensity and pain interference.

	Spearman correlation	
Variables	P Value	Rho value
NRS and General activity	0.001	.624**
NRS and Mood	0.001	.677**
NRS and Mobility to get around	0.001	.680**
NRS and Normal work	0.001	.674**
NRS and Relation with other people	0.001	.723**
NRS and Sleep	0.001	.669**
NRS and Enjoyment of life	0.001	.672**

Table 2. Correlations between NRS and different items modified brief pain inventory P value < .001 is highly significant and represented as **

	SPEARMAN CORRELATION	
VARIABLES	P value	RHO value
PAIN INTENSITY(NRS)	0.001	-.386**
SCIM		

Table 3. Correlation between NRS & spinal cord independence measure P value< .001 is highly significant and represented as **

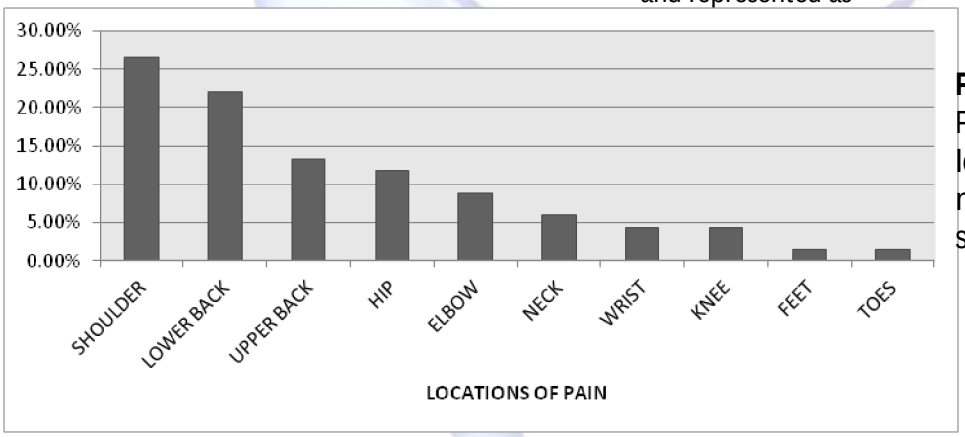

Fig 1. Showing Percentage of locations of pain in musculoskeletal pain sample.

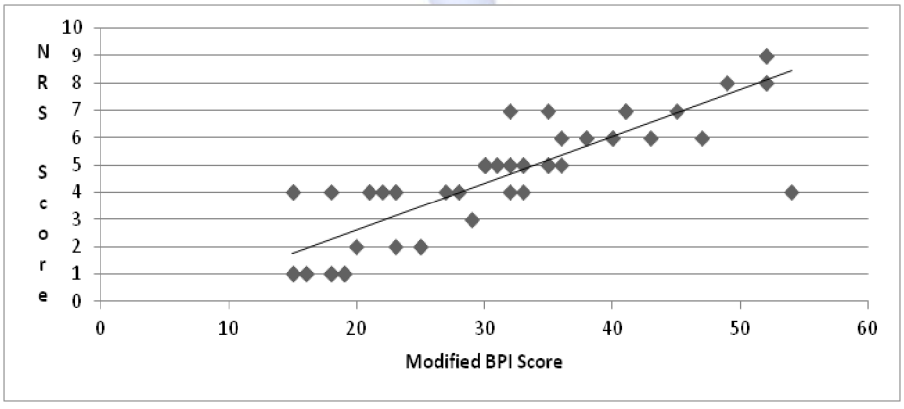

Fig 2. Showing Correlation between NRS and modified brief pain inventory.

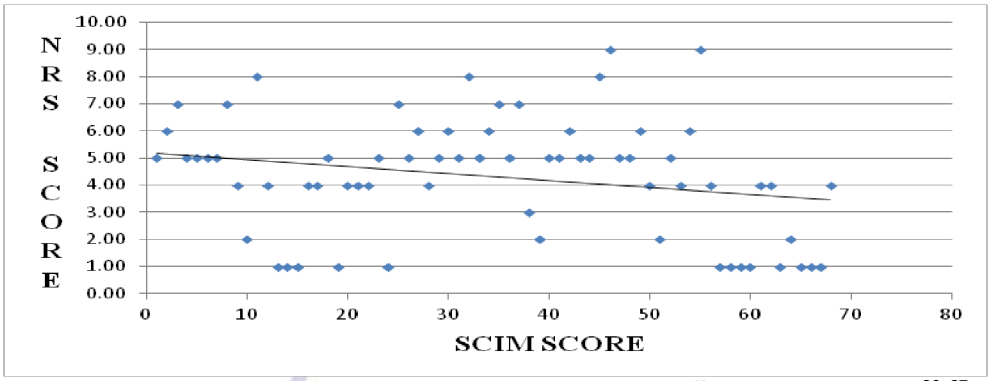

Fig 3. Correlation between NRS & SCIM score.

DISCUSSION

The present study was undertaken to document the incidence of musculoskeletal pain and its impact on daily & functional activities in spinal cord injury patients. The result of the present study shows that there is significant incidence of musculoskeletal pain in spinal cord injury patients. There is also significant musculoskeletal pain impact on daily & functional activities which is evidenced by significant stastical correlations in (Table 1- 3). Therefore, null hypothesis of the study was rejected & alternate hypothesis was accepted.

In the present study, percentage of patients reporting of musculoskeletal pain was found to be 68%. This finding is similar with the studies done by Sie et al. and Nepomuceno et al. where they had stated that percentage of patients reporting musculoskeletal pain to be between 50 – 75% in Spinal cord injury population.[7, 23] This is in accordance with the study done by Siddall et al. on 100 traumatic spinal cord injury patients which stated that musculoskeletal pain was reported by 43 of 73 patients within 5 years of their spinal cord injury.[24]

Locations of pain in this study was found to be more prevalent in Back region combining upper back and lower back, followed by shoulder region, hip, elbow, neck, knee ,wrist, feet and toes (Figure 1). This is in accordance of the study conducted by Turner et al. who found that back was the most common location of pain in chronic spinal cord injury patients.[25] Back pain and neck pain in SCI patients especially who have had surgery to fuse their spine, increased motion that occurs just above and just below the fusion can lead to excessive stresses above or below the level of lesion. Spine segments which are normally most mobile such as T12-L1, C5-T1 may be surgically fixed, causing exaggerated forces on adjacent segments.[26, 27] In the present study patients reporting shoulder pain, elbow pain and wrist pain were found to be 26.5%, 8.8%, 4.4% respectively. Quite common upper extremity musculoskeletal complications as evidenced in the present study, was further supported by the study of by Sie et al. on 136 quadriplegics which found a prevalence 56% shoulder pain, 15% prevalence of elbow pain and 15% prevalence of wrist/hand pain. Another study conducted by Sie et al. on 103 paraplegics found a prevalence of 36% shoulder pain, 16% elbow pain and a prevalence of 13% elbow pain further corroborate the present study.[7]In normal population upper limbs are primarily designed for prehensile activities but in persons with spinal cord injury they are used for weight bearing including transfers, wheel chair propulsion and walking using crutches.[28,29] These activities put abnormal stress on these structures which are primarily designed for mobility not for any weight bearing activity. In this study presence of pain found to be more in hip region followed by knee, feet and toes in lower extremity. This was in accordance with the study done by Knutsdottir et al. who found 61% spinal cord injury patients complained of pain in hip and buttocks followed by 58% in legs and feet.[30] Hip flexion contractures are particularly very common in patients with fractures at the thoracolumbar junction especially around T10-L3. Spine stabilization procedures at these levels will limit lumbar lordosis, so lumbar lordosis cannot be substituted for limitations of hip extension. So abnormal weight bearing positions such as hip flexion rather than hip extension puts hip joint in increased stress, exposing hip joint to degenerative changes. Hip Subluxation and dislocations are also common in those spinal cord injury patients with hip adductor and flexor spasms.[31]

This hip instability can lead to pelvic obliquity and scoliosis leading to degenerative forces on hip leading to hip pain.

Another important observation was that of significant impact on daily activities due to musculoskeletal pain which evidenced by the significant correlation (RHO=.690, P value <.001) between musculoskeletal pain intensity (NRS) score with modified brief pain inventory (Table 1& 2, Figure 2). This is in accordance of the study conducted by Dalyan et al. which found that chronic pain after SCI can cause impaction with daily activities which are over and above the limitations induced by other consequences of injury.[32] It is further supported by the study of Widerstrom-Noga and colleagues et al. which found that 77.3% of 217 patients with SCI and chronic pain reported frequent impaction in at least 1 of 5 activity categories: sleep, work, exercise, household chores, and other daily activities.[33] A study conducted by Rintala et al. in 265 veterans with SCI found that 67% patients reported to have interfered on daily activities, 38% patients interfered "a lot" while 29% interfered "somewhat due to pain in spinal cord injury patients.[34]

There was also high degree of correlations between musculoskeletal pain intensity (NRS) score and 7 different individual items of modified brief pain inventory such as General activity, mobility to get around, mood, normal work, relation with other people, sleep and enjoyment of life. These observations suggest that as pain becomes severe, it can have substantial negative impact on even very daily activities such as sleep, mobility to get around, mood, normal work and other daily activities. Impaction in daily activities significantly reduces the quality of life and difficulty of functional rehabilitation after spinal cord injury. This is supported by the study of Ravenscroft et al. which found that chronic pain has major impact on quality of life of patients after spinal cord injury, often constituting their major problem and being a major cause of unemployment and depression.[35]

Musculoskeletal pain impaction in functional activities is supported by significant correlation (RHO= -.386, P value < .001) between musculoskeletal pain intensity (NRS) score and spinal cord independence measure (SCIM) score. Generally SCIM consists of 3 items such as self care, respiration & sphincter management, mobility out of which self care & mobility activities are of prime importance to the present study. A study conducted by Catz et al. found that SCIM is more sensitive to functional changes in spinal cord injury patients in comparison to functional independence measure.[20] Over all lower scores in SCIM reflects lower scores in self care & mobility activities in the present study indicating greater impaction of musculoskeletal pain in functional activities. This can result greater disability & reduction of quality of life in spinal cord injury population.

CONCLUSION

This study firmly establishes that musculoskeletal pain is one of the most common pain to be experienced by spinal cord injury population. According to the study, musculoskeletal pain has profound impaction on daily & functional activities in spinal cord injury population. The clinical implication of the study to identify effective therapeutic interventions such as physiotherapy modalities or to develop appropriate rehabilitative measures to prevent or treat musculoskeletal pain after spinal cord injury.

LIMITATIONS OF THE STUDY

Small sample size, Long term follow up of musculoskeletal pain and its impact on activities was not done, Lack of data regarding patient's psychosocial and socioeconomic status such as depression and unemployment on musculoskeletal pain's impaction on daily & functional activities, Variable timing of data collection of patients according to duration since spinal cord injury.

FUTURE RESEARCH

Further studies on long term follow up of musculoskeletal pain could be done to find out the exact progression of musculoskeletal pain in spinal cord injury patients.

Similar study to that present study supported with research level imaging data could be done to rule out any incidence of degenerative changes in the joints prior to the study.

A study regarding the effect of patient's psychosocial, socioeconomic status such as depression & unemployment on musculoskeletal pain and its impaction in spinal cord injury patients could be carried out near future.

ABBREVIATIONS

SCI- Spinal cord injury
ADL-Activities of daily living
NRS-Numerical rating scale
MBPI-Modified brief pain inventory
NSAIDS-Non steroidal anti-inflammatory drugs
SCIM- Spinal cord independence measure
NIOH-National institute for the orthopaedically handicapped

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