Spinal Cord (2013) 51, 238–244

www.nature.com/sc

ORIGINAL ARTICLE

Neglected traumatic spinal cord injuries: causes, consequences and outcomes in an Indian setting

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Study Design: Retrospective analysis.
Objectives: To study the causes, consequences and outcomes of neglected traumatic spinal cord injuries (Neg-TSCIs) admitted at the center.
Setting: Tertiary level spinal injury center, India.
Methods: Information was collected from case sheets of 61 persons with Neg-TSCI for whom comprehensive management could not be initiated till at least 4 weeks after the injury and another 62 persons for whom treatment was initiated within 2 days of injury.
Results: The range of duration of neglect was 4–676 weeks. Rehabilitation had not been initiated in 93.4% of Neg-TSCI patients. There was a statistically significant poorer functional outcome in Neg-TSCI.
Conclusions: Neg-TSCIs are injuries in which comprehensive management is not initiated in a timely fashion. Lack of/inadequate awareness was the most common specific cause. Neg-TSCIs add to the complexity of vertebral lesion management, physical and psychosocial rehabilitation. They have a much higher incidence of complications, which are more severe and difficult to manage. They require a longer hospitalization, add to the costs and adversely affect functional outcomes. The findings differ from that of the few studies done in developed countries in that premature discharge in first admission with inadequate or no rehabilitation was the major general cause of neglect rather than overlooked diagnosis and that there was generally an unsupervised period at home before admission to the definitive center. The study brings out the importance of avoiding any delays in starting comprehensive management after spinal injury and taking treatment in a definitive spinal injury center.
Spinal Cord (2013) **51,** 238–244; doi:10.1038/sc.2012.141; published online 27 November 2012

Keywords: neglected; spinal cord injury; complication rate; outcomes; consequences; cause of neglect

INTRODUCTION

Studies have documented better outcomes for patients in whom rehabilitation is initiated early,[1,2] especially, in an organized multidisciplinary spinal cord injury (SCI) care system.[3–7] These studies have been conducted only in developed countries. In emerging countries, the scenario is somewhat different in that not only do spinal injured often present quite late (even months or years after injury) to the definitive center, they have often had either inadequate or no treatment and there is often an unsupervised period at home.[8,9] In a previous study done at our center where demographics of persons with SCI admitted at the center were studied, only 8.1% of patients presented to the center for definitive management within 24h. 18.4% 31.3% and 16.8% presented to the center within 2, 7 and 30 days of the injury respectively, whereas 10.4% patients presented after 1 month and 15.1% after 3 months of the injury.[10] Sometime, the spinal injured are referred late by the initially treating center. However, more often they have been sent back home after only a component of the management (often only conservative or surgical management of the vertebral fracture) has been initiated. Sometime, no treatment has been initiated at all because they have not been to any facility.

Even though delay in initiating comprehensive management is quite a common scenario in developing countries, there is hardly any published literature on its causes and consequences. Sengupta[11] and Rajasekaran *et al.*[12] described the affect of the delay in initiating treatment but only on surgical management of the vertebral fracture.

Hence, we conducted this study to determine the causes and overall consequences of neglected traumatic spinal cord injuries (Neg-TSCIs). It was our hypothesis that delays in initiating comprehensive management add to the complexity of management, have a higher incidence of complications, require a longer hospitalization, add to the costs and adversely affect outcome.

MATERIALS AND METHODS

After approval from the Institutional Ethics Committee, records were reviewed of 61 SCI patients admitted to the center between May 2009 and August 2011 for whom treatment could not be started till 4 weeks after the injury (Neg-TSCI group) and another 62 randomly selected persons with SCI admitted during the same time period for whom treatment was initiated within 2 days of injury (control group) trying to ensure age, gender, rural–urban distribution and mode of injury match between the two groups. A telephonic interview was carried out in Neg-TSCI group to determine the cause of neglect.

Data on demographics, number of institutional transfers, duration and cause of neglect, management of vertebral lesion (and challenges faced), neurological and functional outcome, incidence of associated complications, length of hospital stay, cost of treatment and residual relative kyphotic deformity were collected and analyzed.

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Received 2 July 2012; revised 17 September 2012; accepted 10 October 2012; published online 27 November 2012

RESULTS

Age and gender distribution, economic status, rural–urban distribution and mode of injury are depicted in Table 1, and the number of institutional transfers before reaching definitive hospital in Table 2.

In our study, various specific causes were grouped under three general causes (Table 3). Premature discharge in first admission with inadequate or no rehabilitation (52.5%) and late presentation by the patient (42.6%) were the major general causes, whereas overlooked diagnosis accounted for only 4.9%.

The duration of neglect (injury–admission interval) was 4–8 weeks in 29.5%, 8–24 weeks in 21.3% and more than 24 weeks in 49.2% (Table 4).

A total of 18% had been managed conservatively, 72.1% surgically and no treatment had been provided to 9.8% of persons with Neg-TSCI before they reached the Indian Spinal Injuries Centre. The details of vertebral management at the Indian Spinal Injuries Centre are depicted in Table 5.

Rehabilitation had not been initiated in 93.4% of persons with Neg-TSCI, whereas it had been initiated but left incomplete in another 6.6%.

Bladder and bowel training had not been done in 91.8% and 96.8% of patients, respectively. In 4.9% of patients, bladder training had been done but was not being followed.

The American Spinal Injury Association (ASIA) Impairment Scale (AIS) grade, Spinal Cord Independence Measure score, incidence of associated complications, length of hospitalization, expenses of hospitalization and residual kyphotic deformity of the subjects in both the groups are depicted in Tables 6–11, respectively.

One of the subjects in the Neg-TSCI group deteriorated neurologically from AIS C to AIS A before reaching the definitive center.

Table 1 Depiction of demographics and characteristics of Neg-TSCI and control group

Demographic characteristics	*Neg-TSCI (N = 61)*	*Control (N = 62)*
Mean age ± s.d. (years)	29.90 ± 10.22	32.47 ± 12.74
Age-group distribution (%)		
<20 years	14.75	19.36
20–35 years	57.38	46.77
36–50 years	24.59	22.58
51–65 years	3.28	11.29
Gender (%)		
Male	93.44	83.87
Female	6.66	16.13
Economic status (%)		
Lower	34.43	19.35
Middle	57.38	59.68
High	8.20	20.97
Urban–rural distribution (%)		
Rural	55.74	54.84
Urban	44.26	45.16
Etiology of injury (%)		
Road traffic accident	39.34	37.09
Fall from height	47.54	50.0
Fall of load overhead	3.28	4.84
Gunshot injury	4.92	3.23
Sports	3.28	3.23
Others	1.64	1.61

Abbreviation: Neg-TSCI, neglected traumatic spinal cord injury.

Table 2 Depiction of the number of institutional transfers before reaching definitive hospital in Neg-TSCI and control group

Number of institutional transfer	*Neg-TSCI*		*Control*	
	Number	*%*	*Number*	*%*
0	05	8.19	9	14.52
1	28	45.90	45	72.58
2	17	27.86	8	12.9
3	07	11.48	0	0
>3	04	6.57	0	0
Total	61	100.00	62	100

Abbreviation: Neg-TSCI, neglected traumatic spinal cord injury.
Statistically significant *P*-value <0.001.

DISCUSSION

There is a dearth of literature on Neg-TSCI. To begin with, there is no apparent consensus on what constitutes Neg-TSCI. As per Hassan *et al.*,[13] 'A cervical spinal injury is considered to be neglected when the interval between the injury and the correct diagnosis is more than 3 weeks'. Sengupta[11] defined neglected spinal injuries as injuries not treated in a timely fashion and found late when options are limited. According to Rajasekaran *et al.*,[12] in western world, the term Neglected spinal injuries is usually indicated for injuries that are missed at initial presentation and hence neglected, whereas in developing nations, it often includes missed injuries, as well as injuries which present late without any or with inadequate treatment.

Very often a component of the treatment may be initiated in time but the injury still neglected because comprehensive management is not provided. Neg-TSCI would thus be more appropriately described as injuries in which comprehensive management is not initiated in a timely fashion.

Sengupta *et al.*[11] listed the main cause of Neg-TSCI as overlooked diagnosis. Late presentation in developing countries was also mentioned. Rajasekaran *et al.*[12] also reiterated that in developing countries, late presentation without any or with inadequate treatment along with missed injuries constitute the commonest causes.[12] Other studies have focused mainly on causes of delayed diagnosis.[14–16]

As opposed to developed countries, overlooked diagnosis as a cause was quite uncommon in our study. The patients were generally either discharged prematurely from the previous hospital or presented late to the definitive center. The facilities for comprehensive rehabilitation were often not available at the hospital, initially providing management. The vertebral lesion was managed, and the patients were sent back home with the advice to continue exercises rather than being referred to a definitive spinal injury or rehabilitation center. Quite often, the patients were discharged early, despite rehabilitation facilities being available because of low priority given to rehabilitation by doctors/managers. Lack of awareness of importance of rehabilitation in professionals or in patients and their families, along with low priority to spinal injury rehabilitation by doctors and hospital managers together, was the main cause for 41% of premature discharges. In addition, trying other forms of treatment and ignorance about the seriousness of the injury was the main cause for late presentation in 11.5% of patients. Low priority to spinal injury rehabilitation by doctors and hospital managers, patients/family trying other forms of treatment and ignorance among patient/

Table 3 Depiction of the causes of neglect in persons with Neg-TSCI (in percentage)

General cause	*Specific cause*	*Main cause*	*Secondary cause*[a]	*Combined percentage*[b]
Overlooked diagnosis	a Poly trauma	3.28	0.00	2.06
	b Altered level of consciousness	1.64	0.00	2.06
Late presentation by patient	a Trying other forms of treatment	4.92	0.00	3.09
	b Ignorance about the seriousness of the injury	6.56	2.78	5.15
	c Inaccessibility of definitive hospital	16.39	19.44	17.53
	d Financial constraints	14.75	2.78	10.31
Premature discharge in first admission with inadequate/no rehabilitation	a Nonavailability of hospital beds	3.28	0.00	2.06
	b Request by patients/family because of economic reasons	9.84	8.33	9.28
	c Low priority to spinal injury rehabilitation (both by doctors and hospital managers)	22.95	5.56	16.33
	d Lack of awareness about the importance of rehabilitation in professionals	8.20	36.11	18.56
	e Lack of awareness about the importance of rehabilitation in patient and their families	8.20	25.00	14.43

Abbreviation: Neg-TSCI, neglected traumatic spinal cord injury.
[a]A total of 36 causes in 20 Neg-TSCI.
[b]A total of 97 causes in 61 Neg-TSCI.

family about the seriousness of the injury could be considered to be because of lack of/inadequate awareness. Thus, it could be said that lack of/inadequate awareness was the main specific cause in 52.5% of Neg-TSCI. When the secondary causes were also taken into consideration, it accounted for 58.8% of Neg-TSCI. This points out to the great importance of creating awareness in preventing neglect.

As would be expected from emerging countries, economic factors constituting financial constraints leading to late presentation to a definitive center and seeking premature discharge were also a common cause (24.6%) of neglect. Even though the much higher percentage of subjects from the lower economic status in the Neg-TSCI group suggests that economic factors may be significantly contributing to neglect, the fact that the number of subjects from the middle economic status was fairly even in both groups, and that there were subjects from even the high economic status in the Neg-TSCI group, suggests that other factors may be also significantly contributing to neglect and may be, in fact, overriding the economic ones.

Inaccessibility of definitive hospital also significantly contributed to neglect (16.4%). Like in many other emerging nations, there are very few hospitals in the country providing comprehensive services for spinal injury management. In rural areas, even accessibility to a hospital providing a component of management, like acute management, is often difficult.

Other than the difference in the main causes of Neg-TSCI, our study differed from studies from developed countries in that 95.1% of patients had an unsupervised period at home before reporting for comprehensive definitive management. A total of 83.1% patients had either been sent back or had gone home after only a component of the management (conservative or surgical management of the vertebral fracture) had been initiated. In 6.6% patients, no treatment had been initiated at all because they had not been to any facility, whereas 4.9% patients were trying alternative treatment.

Reduction and alignment were not always attempted in persons with Neg-TSCI, with late presentations with complete neurological deficit. Most often, partial or complete fusion had already taken place by the time the patients presented to the definitive hospital and the dynamic images revealed stability. Very often, the translation, compression and sagital mal-alignment at the fracture site were acceptable. However, in some patients, they were accepted even if they were significant, because correcting at this late stage was likely to require as big a procedure as when the correction was deferred to the time when the mal-alignment caused any symptoms, if it did at all. Such patients were counseled about the possibility of the complications but opted not to go in for surgical management and agreed to follow-up regularly. Some experts prefer to achieve a complete reduction, because residual compression could predispose to late neurological deterioration and syrinx formation.[17,18] However, in emerging countries, financial dynamics often influence decisions. Hence, the vertebral lesion in 11 persons with Neg-TSCI in our study was managed conservatively. Similarly, suboptimal results of previous surgery were accepted in another six persons with Neg-TSCI, but they were similarly counseled that they may need a surgery subsequently.

Where ever reduction is feasible, the strategy for reduction often changes in neglected cases. Preoperative traction is often helpful in cervical injuries and should always be attempted even in late presentations (Figures 1a and b), except when fusion has already taken place. Antero-posterior procedures are more often required to

Table 4 Depiction of the injury–admission interval

Duration	*Number*	*In %*
Neg-TSCI group		
4–8 weeks	18	29.5
8–24 weeks	13	21.31
>24 weeks	30	49.18
Total	61	100.00
Average:*	39.86 weeks	
Control group		
<8 h	7	11.3
>8–24 h	37	59.6
>24–48 h	18	29.1
Total	62	100.00
Average:	9.4 h	

Abbreviation: Neg-TSCI, neglected traumatic spinal cord injury.
*Extreme values were excluded.

achieve reduction in these neglected cases (Figures 1c and d), thus adding to the operating time, blood loss and hospital stay. In thoracolumbar burst fractures with delayed presentation, an otherwise avoidable and more extensive anterior procedure may be needed because indirect reduction is not possible in these late presentations[19,20] (Figures 1e and f). However, in those cases of burst fracture, which any way require an anterior augmentation, the surgical strategy would not change. Anterior decompression, however, is more difficult and time consuming then if it had been done soon after injury.

The strategy changes somewhat for incomplete injuries. Some authors have reported that such injuries may benefit even with late decompression.[21–23] Thus as for incomplete injuries presenting early after injury, there is low threshold to decompress even if they present late, with the hope that some neurological recovery may take place. A total of 16.4% persons with Neg-TSCI in our study were incomplete, and 80% of them were managed surgically.

The outcome of vertebral lesion management is often compromised by the delay in management. There is often a greater residual relative kyphotic deformity. Delay in the stabilization of unstable type

Table 5 Depiction of the vertebral management in persons with spinal cord injury in both groups. a) Vertebral management of persons with Neg-TSCI before ISIC and of control group at ISIC. b) Vertebral management of persons with Neg-TSCI at ISIC

a) Types of management	*Neg-TSCI—before ISIC (%)*	*Control—at ISIC (%)*
Conservative	18.03	25.80
Surgical	72.13	74.20
No treatment	9.84	0.00

b) Previous management	*Management at ISIC*	*Neg-TSCI group (%)*
Conservative	No further management	13.11
Conservative	Surgical	4.92
Surgical	Revision surgery	6.56
Surgical	No further management	65.57
No treatment	Surgical	4.92
No treatment	No further management	4.92

Abbreviations: ISIC, Indian Spinal Injuries Centre; Neg-TSCI, neglected traumatic spinal cord injury.

Table 6 AIS at admission and discharge of persons with Neg-TSCI and of control group

AIS	*Neg-TSCI, n (%)*		*Control, n (%)*	
	Admission	*Discharge*	*Admission*	*Discharge*
A	52 (85.24)	51 (83.60)	55 (80.64)	53 (85.48)
B	3 (4.91)	3 (4.91)	4 (6.45)	5 (8.06)
C	6 (9.83)	4 (6.55)	3 (4.83)	2 (3.22)
D/E	[a]	3 (4.91)	[a]	2 (3.22)
Total	61 (100)	61 (100)	62 (100)	62 (100)

Abbreviations: AIS, American Spinal Injury Association (ASIA) Impairment Scale; Neg-TSCI, neglected traumatic spinal cord injury.
[a]Excluded from the study.

Table 8 Incidence of associated complications in Neg-TSCI and control group (in percentage)

Complications	*Neg-TSCI*	*Control*
Integumentary		
Pressure ulcers	62.30	16.13
Urogenital		
Symptomatic urinary tract infection	50.82	25.81
Nonfunctional kidney	1.64	0.00
Vesico-ureteric reflux	3.28	0.00
Bladder/kidney/vesicle calculi	11.48	1.61
Hydronephrosis	5.66	1.61
Fournier's gangrene	1.64	0.00
Para urethral abscess	1.64	0.00
Urethral fistula	1.64	0.00
Respiratory		
Respiratory infection	14.75	12.90
Cardiovascular		
Autonomic dysreflexia	11.48	4.84
Symptomatic deep vein thrombosis	8.20	4.84
Gastrointestinal		
Hemorrhoid	18.03	4.84
Faecolith impacted bowel	24.59	6.45
Recurrent constipation	62.30	24.19
Paralytic ileus	9.84	8.06
Pancreatitis	1.64	0.00
Malena	1.64	3.23
Musculoskeletal		
Contracture	29.51	3.23
Spasticity requiring medication	36.07	14.52
Spinal relative kyphotic deformity $>20^{\circ}$	37.70	0.00
Psychosocial		
Depression requiring medication	19.67	9.68

Table 7 Average SCIM score according to the level of injury in Neg-TSCI and Control group

Levels	*Neg-TSCI*				*Control*			
	Number	*Admission*	*Discharge*[a]	*Improvement*[a]	*Number*	*Admission*	*Discharge*[a]	*Improvement*[a]
Lower cervical	18	4.67	19.72	15.06	8	5.5	25.75	20.25
Dorsal	17	9.53	51.94	42.41	16	11	63.75	56.75
Dorso lumbar	14	11.43	67.57	56.14	29	10.24	75.62	65.38
Lumbar	9	12.33	77.33	65.00	7	11.14	78.00	66.86

Abbreviations: Neg-TSCI, neglected traumatic spinal cord injury; SCIM, Spinal Cord Independence Measure.
[a]Statistically significant *P*-value <0.05.

Table 9 Depiction of the mean length of stay (in days) of persons with AIS A + B spinal injury in Neg-TSCI and control group.

AIS, type of injury	*Neg-TSCI*[a]	*Control*
AIS A + B, low tetraplegia	111.07	92.42
AIS A + B, high paraplegia	84.30	59.33
AIS A + B, low paraplegia	65.72	47.40

Abbreviations: AIS, American Spinal Injury Association (ASIA) Impairment Scale (AIS); Neg-TSCI, neglected traumatic spinal cord injury.
Because of small sample size of high tetraplegics and persons with AIS C injury, the length of stay for these groups has not been analyzed.
[a]includes duration of stay in previous hospital.

Table 10 Depiction of the mean expenses of hospitalization (in USD) of persons with AIS A + B injury in Neg-TSCI and control group according to level of injury for economy ward

Type	*Neg-TSCI*	*Control*
Low tetraplegics	10428.36	6081.90
High paraplegics	10107.25	5515.69
Low paraplegics	6790.50	4164.10

Abbreviations: Neg-TSCI, neglected traumatic spinal cord injury; USD, United States dollar.
Conversion rate: 1 USD = 49.9 Indian rupee (INR).

Table 11 Depiction of the number of patient with residual relative kyphotic deformity in Neg-TSCI and control group

Residual relative kyphotic angle	*Neg-TSCI*[a]	*Control*[b]
0—5°	12	16
6—100°	10	18
11—20°	8	12
21—30°	12	0
31—40°	2	0
>40°	4	0

Abbreviation: Neg-TSCI, neglected traumatic spinal cord injury.
Statistically significant $P<0.05$.
[a]Values available for 48 patients.
[b]Values available for 46 patients.

A burst fractures or unrecognized type B fracture may predispose to progressive post-traumatic kyphotic deformity.[11] In this study too, the residual relative kyphotic deformity was significantly greater in the Neg-TSCI group (Table 11). This could be partly because of acceptance of sagital mal-alignment in some person with Neg-TSCI as mentioned before, and also because of suboptimal realignment in some others due to delayed surgery. The duration of follow-up was not enough to be able to determine if the residual kyphotic deformity predisposed to a higher incidence of late complications of back pain, delayed neurological deficit or syringomyelia as suggested by some studies.[17,18,24,25]

It is well known that the consequences of neglect can be devastating. The most serious consequence is progressive neurological deficit, whereas more complex management, progressive deformity (Figure 2a), persistent pain and overall compromised outcomes are the more frequently encountered consequences.[11,25,26] In our study, one patient deteriorated from AIS C to AIS A because of neglect. Secondary neurological deficits are more common in the thoraco-lumbar spine because of the relatively narrow spinal canal in the region, even though overlooked diagnosis is 4.5 times less common in this region as compared with cervical spine (22.9% versus 4.9%).[14]

It is expected that Neg-TSCI would predispose to an increased incidence of complications[7] associated with SCI. Pressure sores,[7,27,28] upper and lower urinary tract complications,[7] gastrointestinal complications (hemorrhoids, faecolith impacted bowel, recurrent constipation), contractures, spasticity, residual relative kyphotic deformity, pain,[29] respiratory infection and psychosocial complications (depression) are some of the complications which persons with Neg-TSCI are especially predisposed to, as was also obvious from the findings of our study. Not only was the incidence of associated complications increased, they were often more severe and more difficult to manage with poorer outcomes. For example, chronic vesico-uretric reflux resulted in nonfunctional kidney in one person with Neg-TSCI (Figure 2b). Pressure sores were not only big, multiple and deep (generally grade IV), they often had underlying osteomyelitis or septic arthritis, thus complicating management (Figure 2c). The delay in initiating comprehensive management and, especially,

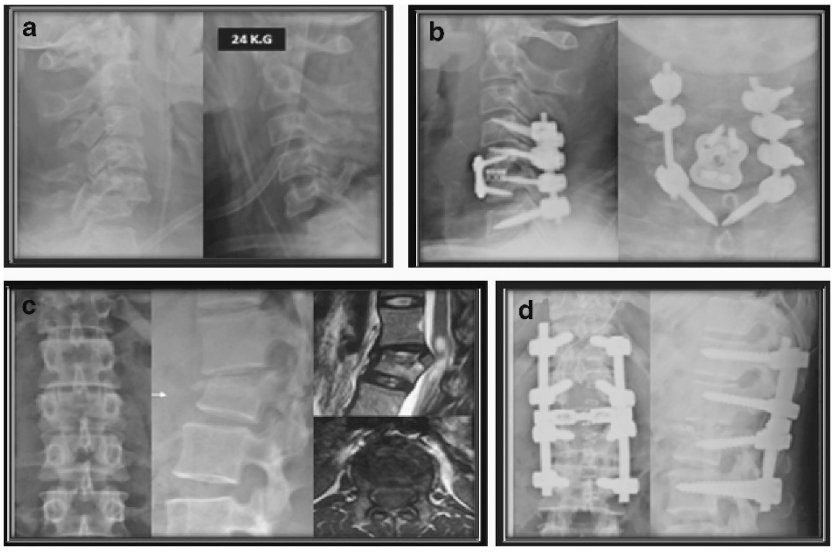

Figure 1 Depiction of two Neg-TSCI cases, which were managed surgically. Even though reduction can be achieved by preoperative traction in some persons with cervical Neg-TSCI, thereby requiring only anterior fixation, more often traction fails to achieve reduction as in this case. (**a**) Combined anterior and posterior procedures are required for reduction and fixation in such cases. (**b**) Thoraco-lumbar and lumbar fractures presenting late (**c**) generally require combined anterior and posterior procedure (**d**), which are more often being done through posterior approach only as in this subject.

Figure 2 Depiction of complications in persons with Neg-TSCI. (**a**) Depiction of pre and postoperative images of a person with post-traumatic kyphotic deformity with severe pain interfering with activities of daily living, despite proper conservative treatment. Surgery was able to reasonably correct the deformity and resolve the symptoms. (**b**) Depiction of micturating cystourethrogram demonstrating vesico-uretric reflux grade III and IV on right side. Renal scan in this person demonstrated nonfunctional right kidney. (**c**) Depiction of grade IV sacral sore with associated septic arthritis of both hips (right > left). Management-required debridement of the right hip, drainage of the cavity communicating posteriorly with gluteal abscess, removal of sequestered pieces of the head and other necrotic tissue, debridement of sacral sore and gluteus maximus flap. The person also had bilateral trochanteric sores as well as pressure sore over left knee and bilateral heels. (**d**) Depiction of fused hips due to heterotrophic ossification and contractures in the knees in a lady who presented for rehabilitation 13 years after injury. She had been more or less confined to bed since injury. Sub-trochanteric osteotomies, contracture release at the knees and customized seating were required to improve wheelchair seating.

rehabilitation and the unsupervised period at home are likely factors responsible for the increased complication rate.

Neg-TSCIs pose complexities in the rehabilitation program.[9] There are complexities in physical rehabilitation due to contractures, excessive spasticity, deformities, unhealthy skin, pressure sores and so on. For example, these complications often necessitated customized seating (Figure 2d). Bowel and bladder training was more complicated and took a longer time period. Faecoliths, impacted bowel and associated complications like hemorrhoids were reasons for requirement of prolonged bowel training. Similarly, hyper-reflexia, contracted bladder, calculi, fistula and so on affected the bladder training. A delayed initiation in treatment also adds to psychological problems, which often need a longer psychological intervention. Thus, the observation that the rehabilitation outcomes were compromised in persons with Neg-TSCI in our study was comparable to the observations in other published studies.[1,2]

The overall outcome thus gets compromised in Neg-TSCI. Other than the compromised outcomes of the vertebral lesion and rehabilitation, there is a longer hospital stay and higher costs of hospitalization.[27] This was clearly evident from our study.

Retrospective design and limited number of subjects were limitations of the study. Because, length of stay, expense of treatment and neurological, as well as functional outcomes are affected by other factors like level and completeness of injury, the sample size was especially suboptimal to draw a definite conclusion for these parameters. Hence, prospective studies with larger number of subjects are required in order to draw a definite conclusion in this regard.

Also, the period of late presentation beyond 4 weeks, which was used to determine Neg-TSCI in this study, was based on the assumption that this delay in initiating comprehensive management would definitely have compromised outcome. Even though the study confirmed this, it cannot be assumed that a delay of a lesser duration would not compromise outcome. Hence, further studies would also be required to determine this duration. However, one could definitely conclude that comprehensive management should be initiated in a timely fashion and any delays should be avoided.

CONCLUSIONS

Neg-TSCIs are injuries in which comprehensive management is not initiated in a timely fashion. The commonest specific cause is lack of/inadequate awareness among the professionals, patients and

managers. As would be expected from emerging countries, economic factors were the second most common specific cause. Neg-TSCI adds to the complexity of management of vertebral lesion. They make physical and psychosocial rehabilitation more challenging. They have a much higher incidence of complications, which are more severe, complicated and more difficult to manage. They require a longer hospitalization because of complications and more complex management. They add to the costs because of longer hospitalization and more complex management. They adversely affect functional outcomes. They also affect neurological outcomes in a few. Larger prospective studies are required to draw a definite conclusion.

The findings of the study differ from the few studies done so far in developed countries in that premature discharge in first admission with inadequate or no rehabilitation was the major general cause of neglect rather than overlooked diagnosis, and that there was generally an unsupervised period at home. The study brings out the importance of avoiding any delays in starting comprehensive management after spinal injury, as well as taking treatment in a definitive spinal injury center and the need to emphasize this through awareness programs. It also brings out the need to establish more facilities for providing spinal injury management.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

We acknowledge the contribution of Mr Kulwant Kapoor for statistical analysis of our data. We also acknowledge the contribution of Dr Nitin Agarwal and Dr Pramod Paharia in collecting data for the study.

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