

Association between SCIM III - Self Component in Patients with Spinal Cord Injury

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Abstract: ***Background:** Spinal cord injury (SCI) is a life-long condition, which can significantly impact the health and well-being of affected individual. Appropriate administration is essential to maximize health related quality of life. **Purpose:** To calculate the clinical significance of the Spinal cord independence measure – III (SCIM-III) according to distribution based approaches. **Objective:** To find comparison between all self-components with total score in patients with spinal cord injury. **Method:** The evaluation was carried out on 10 traumatic spinal cord injury patients out of which 7 were male and 3 were female patients. All patients were aged between 18 to 55 years. All subjects and their relatives received full information about the study and they were provided the written informed consent prior to their participation in the study. Data required for Spinal cord independence measure- III as well as spinal cord injury patients were entered into PubMed, Google scholar and Ovid databases, which included Medline, CINAHL, and Journals at Ovid full text, EBM reviews. Studies written in English language were included. **Result:** P-value was considered extremely significance in: self – care and total score with correlation co-efficient $r = 0.52$; Mobility and total score with correlation co-efficient $r = 0.34$. Also displays linear regression with 95% confidence interval of self-care and total score, respiration and sphincter management and total score and Mobility and total score. **Conclusion:** The results of this study through interview & observation, which appears to be useful for research of spinal cord injury patient groups. We believe that the present SCIM-III version will be a valuable tool for assessment in hospitalized/outpatient individuals with SCI.*

Keywords: Spinal cord injury, SCIM-III, SCI patients, Spinal cord lesion

1. Introduction

Spinal cord injury is traumatic damage to the spinal cord or nerves at the end of the spinal canal. This affects the conduction of sensory and motor signals across the site of the lesion. There are two types: Incomplete lesion and complete lesion. The spinal cord has longitudinally oriented spinal tracts (white matter) surrounding central areas (gray matter) where most spinal neuronal cell bodies are located. The spinal column is divided into four regions: Cervical (7 vertebrae), Thoracic (12 vertebrae), Lumbar (5 vertebrae), and Sacral (5 vertebrae)¹ Males account 80% of new cases. The average age at injury has gone up from 14 years to 60 years currently. Life expectancy decreases for all individuals with spinal cord injury, compared to those without a spinal cord injury. Strong inconsistencies in data were noted when analyzed between countries but the most frequent causes of spinal cord injury are reported: 1) Motor vehicle accidents, 2) Falls, 3) Sport injuries, 4) Work related accidents, 5) Violence.² There is no reliable estimate of global prevalence, but estimated annual global incidence is 40 to 80 cases per million population. Up to 90% of these cases are due to traumatic causes, though the proportion of non-traumatic spinal cord injury appears to be growing. In India, the average of SCI is 15000 with the prevalence of 0.15 million. According to the world health organization (WHO).³

The Spinal Cord Independence Measure (SCIM) is a comprehensive disability rating scale that has been designed precisely for patients with spinal cord lesions (SCLs). The demand for the scale is gradually increasing, and has been endorsed by key participant groups. For instance, the

international group for recovery outcome measures, which was sponsored by the US National Institute on Disability and Rehabilitation Research (NIDRR) framework for the appraisal of evidence of metric properties, recommended that the latest version Spinal cord independence measure – III (SCIM-III) should be implemented worldwide as the primary functional recovery outcome measure for spinal cord injuries (SCIs). As well, the expert section of the Spinal Cord Injury Solutions Network (SCISN) concluded that the clinical utility and psychometric properties of the SCIM are appropriate for patients with acute traumatic SCI. SCIM-III was tested for validity and reliability in an international multi-center clinical study, and the findings supported the reliability and the validity of the scale.⁴ SCIM-III scale is applied for the assessment of achievements of daily function of patients with spinal cord lesions (SCLs). The third version (SCIM-III) contains 17 tasks organized in 3 subscales: self-care, respiration and sphincter management, and mobility. The first and second versions of SCIM were introduced following studies performed in Israel. The psychometric properties of SCIM-III were examined in a broad international study. SCIM-III was recognized as the best available comprehensive SCL-specific functional status measure. The instrument is widely used, and many professionals who implemented SCIM-III in their clinics have provided positive feedback. A study comparing SCIM-III assessments by interview and observation showed moderate-to-good reliability and acceptable results, indicating that SCIM-II can be used by interview. The ability to use SCIM-III by interview is particularly important, because SCIM-III is being used in many SCL units, some of which may lack optimal conditions for observation. SCL patients may require life-long follow-up

after discharge from rehabilitation hospital, and an interview version of SCIM-III can help professionals interacting with this population to evaluate their functional status at home, in outpatient clinics and other settings.⁵

The SCIM has been used by several groups to examine significant improvements in the everyday activities of SCI patients. Need for the study was to assess the clinical significance of SCIM-III in a group of SCI patients. The objective of this study is to find comparison between all self-components with total score in patients with spinal cord injury.

2. Methodology

This is a study which is a part of longitudinal research project scanning over two years the evaluation was carried out on 10 traumatic spinal cord injury patients out of which 7 were male and 3 were female patients. All patients were aged between 18 to 55 years. The following inclusion and exclusion criteria were used for selection of spinal cord injury patients: Inclusion criteria: 1) Age group 18-55yrs. 2) both genders i.e. Male and Female. 3) SCI patients (Grade A to Grade D as per ASIA). 4) Sub-acute & chronic stage SCI patients. Exclusion criteria: 1) Severe complications of SCI e.g. - Autonomic dysreflexia. 2) Patients with orthostatic hypotension. 3) Patients with other cardiovascular complications & any other muscular deformity. All subjects and their relatives received full information about the study and they were provided the written informed consent prior to their participation in the study. Outcome measures on patients and the data will be statistical analyzed. The electronic search was done by cross checking the references list of all relevant articles. We covered all the documents available on this sources. We took only those articles which were present in English language. We used the following indexing and text terms to search the data: Spinal cord independence scale – III or SCIM-III, Spinal cord injury patients. The eligibility Criteria were: 1) Articles were referred for Spinal cord injury, SCIM-III. 2) Studies written in English language were included.

The Spinal Cord Independence Measure-III (SCIM-III) was specifically developed for use in patients with spinal cord injuries to assess their ability to complete routine daily tasks and activities of daily living. The SCIM-III is a clinician-rated instrument comprised of 17 items across 3 subscales: (1) self-care, (2) respiration and sphincter management, and (3) mobility, with items being weighted according to assumed clinical importance. The SCIM-III has shown to be a reliable and valid instrument for the functional evaluation of individuals with spinal cord injuries and has been endorsed by relevant stakeholders and outcomes assessment experts for use in clinical and research contexts. The SCIM-III has been translated and validated in multiple languages, and self-report and youth versions have been developed.

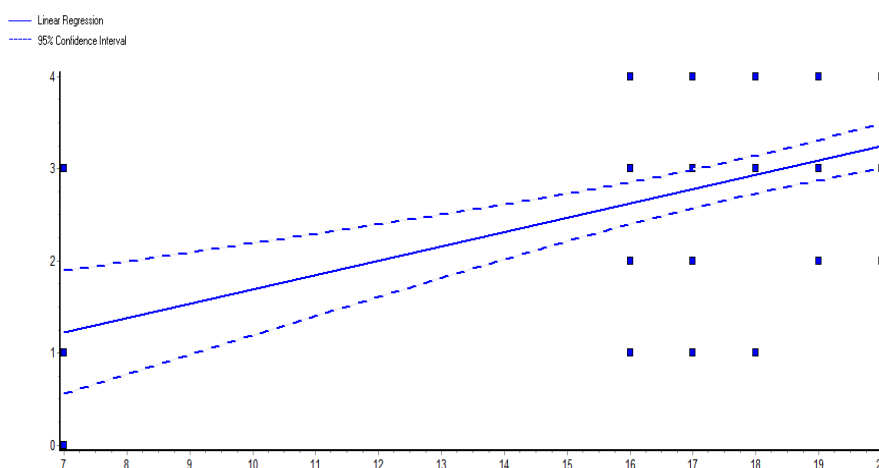
3. Result

The Spinal Cord Independence Measure III (SCIM-III) was specifically developed for use in patients with spinal cord injuries to assess their ability to complete routine daily tasks and activities of daily living. The SCIM-III is a clinician-rated instrument comprised of 17 items across 3 subscales: (1) self-care, (2) respiration and sphincter management, and (3) mobility, with items being weighted according to assumed clinical importance. The SCIM-III has shown to be a reliable and valid instrument for the functional evaluation of individuals with spinal cord injury

The functional total score was detected by SCIM – III in patients with spinal cord injury with complete and incomplete lesion.

Table 1: Shows association of self – care and total score in linear regression with 95% of confidence interval:

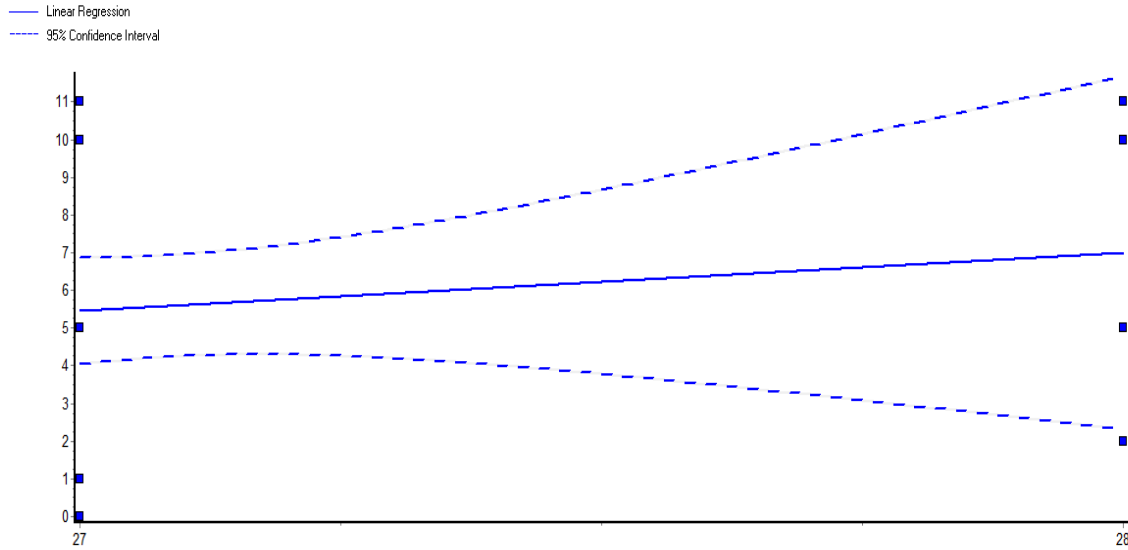
Self – care and Total score		
Sr. No	Sub-components	Mean Score
1	Feeding	3
2 (a)	Bathing (upper)	2.75
2 (b)	Bathing (lower)	1.75
3 (a)	Dressing(upper)	3.66
3 (b)	Dressing(lower)	3.16
4	Grooming	3
Total		17.66



Interpretation: Correlation co-efficient $r = 0.5287$; P value is < 0.0001 , considered extremely significant

Table 2: Shows association of respiration and sphincter management and total score in linear regression with 95% confidence interval: Respiration and Sphincter Management and Total score

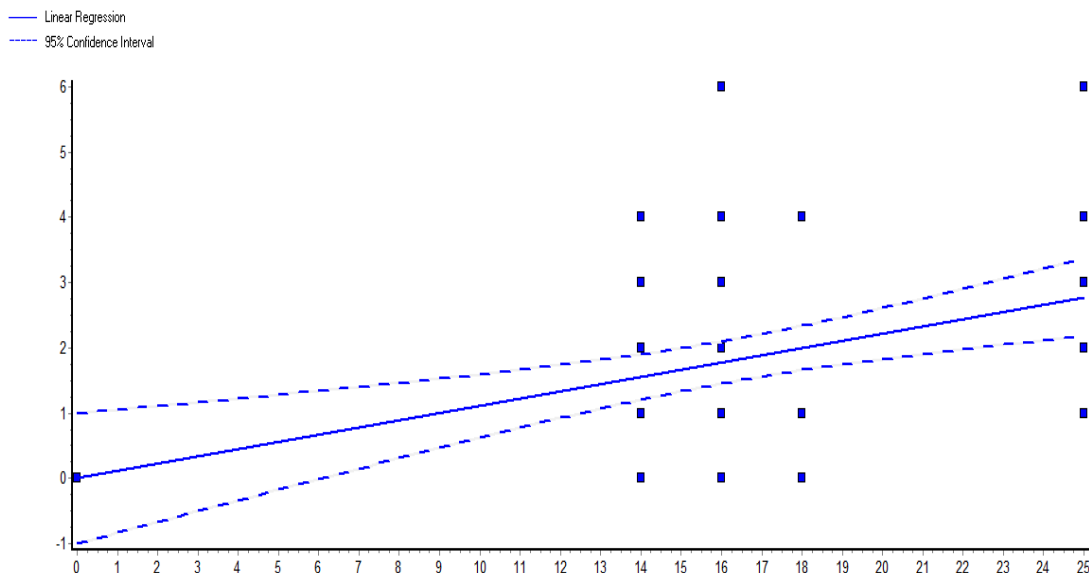
Sr. No	Sub-components	Mean Score
5	Respiration	10
6	Sphincter Management - Bladder	8.25
7	Sphincter Management - Bowel	3.83
8	Use of Toilet	0.75
	Total	27.08



Interpretation: Correlation co-efficient $r = 0.0934$; P value is < 0.5277 , considered not significant.

Table 3: Shows association of Mobility and Total score in linear regression with 95% confidence interval: Mobility and Total score

Sr. No	Sub-components	Mean Score
9	Mobility in Bed and Action to Prevent Pressure Sores	4
10	Transfers: bed-wheelchair	1.08
11	Transfers: wheelchair-toilet-tub	0.25
12	Mobility Indoors	3.41
13	Mobility for Moderate Distances (10-100 meters)	3.33
14	Mobility Outdoors (more than 100 meters)	3.16
15	Stair Management	0.16
16	Transfers: wheelchair-car	0.75
17	Transfers: ground-wheelchair	0.83
	Total	16.25



Interpretation: Correlation co-efficient $r = 0.3463$; P value is < 0.0002 , considered extremely significant

4. Discussion

The SCIM was developed to address three specific areas of function in patients with (SCI) spinal cord injuries. It looks at self-care (Feeding, Grooming, Bathing, and Dressing), respiration and sphincter management (Respiration, Sphincter management- Bowel, Sphincter management- Bladder, Use of toilet), and a patient's mobility abilities (Bed and transfers and indoors/outdoors). We analyzed the association between SCIM-III total scores and individual SCIM III item scores using linear regression to show the expected activities of daily living after Spinal cord injury onset and provided a step-by-step index for efficient rehabilitation planning. Additionally, the SCIM can also be used to help guide clinicians in determining treatment goals and objectives for patients with a SCI. The SCIM has been developed, validated, and found to be highly reproducible for patients with spinal cord injuries.

The SCIM-III (Self-care, Respiration and sphincter management, Mobility) were selected as outcome variables. As self-care and mobility subcategories have item predominantly related to the use of the upper limb (transfers, wheelchair mobility, grooming etc.) and reflect upper limb performance. The sum of the self-care ranges from 0 to 20 points and mobility is the sum of the SCIM mobility from 0 to 37 points minus the score for the "stair" item.

In our study, a difference in the order of understanding between paraplegia and tetraplegia was witnessed. In the total population, the expected SCIM-III total scores to attain modified independence in self-care and mobility indoors or moderate distance. The expected SCIM-III total scores gradually increased according to the relative difficulties of each activities of daily living item. This was observed in both paraplegia and tetraplegia with some exclusions. In the feeding, grooming, dressing upper, and other items, the achievement levels were different between tetraplegia and paraplegia. The linear regression showed for each SCIM-III item. Feeding and grooming items were the easiest ADL items, such that even persons with low SCIM-III total scores reached at least the modified independence level; however, larger improvements were necessary to achieve complete independence. Our observation associated to the fact that feeding and grooming activities can be trained without leaving the bed, allowing early intervention. In compare, bathing the lower body, use of toilet, transfers (wheelchair-toilet tub, wheelchair – car, ground-wheelchair, wheelchair-car & bed - wheelchair), and stair management indicating that independence would only be possible in persons with high SCIM-III total scores. Among these items, stair management and transfers (wheelchair- toilet tub, ground-wheelchair, wheelchair-car and stair management) were the most difficult: persons with a SCIM-III total score of at least 50 were able to achieve independence for these items. Our results, however, showed a clear difference in probabilities of independence in certain ADL items between paraplegia and tetraplegia. Compared to previous studies, our study included a high percentage of individuals with incomplete tetraplegia.

In one of the published study in 2001 to date to examine predictions of patient self-care outcomes by team investigators found that patients and professionals shared very similar expectation about functional outcomes; the self-care performance component of the study generated important findings as well. The highest performance was reported in feeding. Eating may be considered more important than others as it is the only task that can be performed in public. Grooming, Dressing, Bathing are also performed.

One reason may be the difference in the complete SCI ratio between tetraplegia and paraplegia. In our study, the proportions of complete lesions in the paraplegia and tetraplegia groups were approximately 90% and 10%, respectively. Feeding, grooming, and dressing upper can be completed with upper extremity function; these items might not be influenced by trunk function. Thus, it is difficult to attain modified independence level for these items with tetraplegia, but not paraplegia. As mentioned above, in our study, approximately 90% of participants with Paraplegia had incomplete injury. Regardless of the types of injury, such as central cord syndrome, incomplete tetraplegia was shown to have a favorable functional outcome in terms of ambulation.⁶ With intensive exercises and appropriate braces, persons with complete paraplegia could climb and go down the stairs.⁷ Because of energy consumption, costs, and/or living arrangement, however, compliance to brace ambulation in daily life was far from satisfactory.⁸ According to the recent report by van Middendorp et al, the chance of individuals with complete paraplegia achieving independent ambulation was quite low, especially for those with older age. The mean age of the participants in this study was relatively old; they had quite a small chance of regaining independent walking. This difference in our cohort might have influenced the difference in the relative difficulty with the stair item between tetraplegia and paraplegia.

5. Conclusion

The study concluded that we employed linear regression analyses to demonstrate that the SCIM - III total score is a good predictor of individual SCIM-III items scores. The spinal cord injury patients with paraplegia had remarkable achievement in sub-components of self-care and mobility excluding stair management. Because the present study did not limit the type or severity of SCI included in the analysis, our results regarding this association are generalizable to both complete and incomplete SCI.

6. Acknowledgement

Presentation, inspiration and motivation have always played a key role in the success of any venture. I pay my deep sense of gratitude to Dr. Suvarna Ganvir (H.O.D) and my guide Dr. Maheshwari Harishchandre whose valuable guidance and kind supervision was provided to me.

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