

Functional Independence and Quality of Life in Traumatic Below T6 Level Spinal Cord Injury at Different Time Spans

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ABSTRACT

Background: Trauma is the most frequent cause of spinal cord injury in Indian adult populations. Injury results from damage caused by traumatic events such as motor vehicle accidents (40.4%), falls (27.9%), violence (15.0%), and sports (8.0%).

Aim: To find out the level of functional independence and quality of life in a person with traumatic below T6 level spinal cord injury as time progresses

Study Design & Setting: observational study & Tertiary care center, neuro-rehabilitation center.

Methods and Material: The sample size was 45 and each group had 15 spinal cord injury individuals. Inclusion was of both genders, traumatic incomplete below T6 level of spinal cord injury and sub-acute to chronic phase spinal cord injury were taken. The exclusion was a traumatic head injury and recent trauma to the lower limb.

Statistical analysis: Analysis was done using SPSS V 26. Krushkal Wallis test was used for the non-parametric data, and the mean and standard deviation were calculated.

Results: WHOQOL and SCIM were the scales used and mean values of the same at 3 different time spans are as follows: for WHOQOL, Physical domain 48, 56, 56., Psychological 39, 51, 54. c) Social 54, 60, 59, Environmental 52, 62, 64. Similarly, SCIM showed 36, 47 and 52

Conclusion: The study concludes that quality of life and functional capacity show a much better and significant improvement in the acute and subacute stage post-injury after which their stagnancy is observed

Keywords: Quality of life, Traumatic, Spinal cord injury, Functional independence

INTRODUCTION

Spinal cord injury is a physically disabling type of injury that not only affects the neurological system but also many other systems like musculoskeletal, cardiopulmonary, integumentary, gastro-intestinal, genitourinary and sensory¹. Paralysis of the muscles below the level of

injury can lead to limited and altered mobility, self-care and ability to participate in valued social activities. Spinal cord injuries can be grossly divided into two broad etiological categories: traumatic injuries and non-traumatic damage. Trauma is the most frequent cause of injury in adult spinal cord injury rehabilitation populations.

Injury results from damage caused by traumatic events such as motor vehicle accidents (40.4%), falls (27.9%), violence (15.0%), and sports (8.0%). Spinal cord injuries can further be divided into two broad functional categories: tetraplegia and paraplegia. Paraplegia refers to complete paralysis of all or part of the trunk and both lower extremities, resulting from lesions of the thoracic or lumbar spinal cord or cauda equina.

The psychological effect after spinal cord injury is much more disabling than the physical impact¹. For any individual who was earlier in a functioning state to undergo such a trauma that not only impairs him physically but also has deleterious effects on his psychological and emotional systems¹.

Quality of life is defined as individuals' perception of their position in life in context to the culture and value systems in which they live and about their goals, expectations, standards and concerns². As the quality of life is an individual's perception and so can differ from person to person hence cannot be used as a solid mean of measurement of any symptom or disease but rather measures the effect of the symptom or disease on one's life². Quality of life is not a unidimensional but a multidimensional process and hence World Health Organization has developed WHOQOL-100 which looks after all the domains of quality of life in detail but this outcome measure due to its extensive nature is very lengthy and time-consuming Hence WHO has developed WHOqol-BREF². Spinal cord injury measurement scale is a functional outcome measure that assesses person's functional dependence and independence under the domains of self-care, respiratory and sphincter management and mobility [room and toilet]³.

Hence to check the functional independence level of a person outcome measures like the Spinal Cord Independence Measure [SCIM] (version III, Sept 14, 2002) can be used⁴.

The suddenly reduced functional capacity of an individual after an SCI compromises not only the patient's QOL but also his day-to-

day activities. There is also an impact on the family, which is required to restructure itself to provide care to the disabled family member, possibly leading to a great psychological, social and economic impact on both the patient and the family⁵.

Need of study

The amount of functional dependence or independence of the individual with SCI largely affects the psychosocial, social and environmental aspects of life so its measurement is important and will help in planning a proper and effective rehabilitation program for the betterment of the individual. Although spinal cord injury patients get medically cured their functional independence and quality of life after discharge is variable. Thus, we want to study to see the level of functional independence and quality of life in a below T6 level traumatic spinal cord injury concerning different time durations. As these factors are variable, we would like to assess whether there is an improvement or deterioration in the 4 domains of quality of life and functional independence. Though rehabilitation in these patients starts immediately after the medical management, frequent assessment of the patient's functional independence and quality of life may help the therapist plan a better protocol for the patient. Hence its aim and objectives are to find out the level of functional independence and quality of life in a person with traumatic below T6 level spinal cord injury as time progresses.

MATERIALS & METHODS

An observational study design using purposive sampling was conducted. A total of 45 individuals ranging from 18 years to 65 years were included in the study and respectively assessed. Out of which 32 were male and 13 were female participants. the sample size was 45 and each group of period 15 spinal cord injury individuals. Inclusion was of both genders, traumatic incomplete below T6 level of spinal cord injury and sub-acute to chronic phase spinal

cord injury were taken. The exclusion was a traumatic head injury and recent trauma to the lower limb.

PROCEDURE

After seeking permission from the Institutional Ethical Committee and following the guidelines, subjects who met the inclusion criteria and willingly agreed to participate in the study were included. Two scales were used Spinal Cord Independence Measure (SCIM) version III was used to assess functional independence and the WHO QOL BREF field trial version was used to assess participant’s quality of life. After completing the scales further scope of the study and its clinical implication and importance were told and the data gained was then compiled to make the Master chart after which the further process of data analysis was started

STATISTICAL ANALYSIS

Statistical analysis was done using IBM SPSS V 26. Kruskal-Wallis test was used for the non-parametric data, through which the mean and standard deviation were calculated, with the value of significance set at $p < 0.05$ and the following results were obtained.

RESULT

A total of forty-five participants with traumatic below T6 level spinal cord injury participated in the study. Out of which 32 were males and 13 were females. These participants were further divided into 3 groups according to their time spans post-injury specifically 6 months to 1 year post-injury, 1 year to 2 years post injury and 2 years to 3 years post injury with a number of 15 per group

Table 1: Demographic data

Characteristics	Values
Age	35.6+ 14
Gender	F= 13, M= 32
level of injury	D6=11.1%, D7=4.4%, D8=4.4%, D9=4.4%, D10=13.3%, D11=11.1%, D12=26.7%, L1=11.1%, L2=13.3%
ASIA scores	B=64.4%, C=22.2%, D= 13.3%

Figure 1: Gender

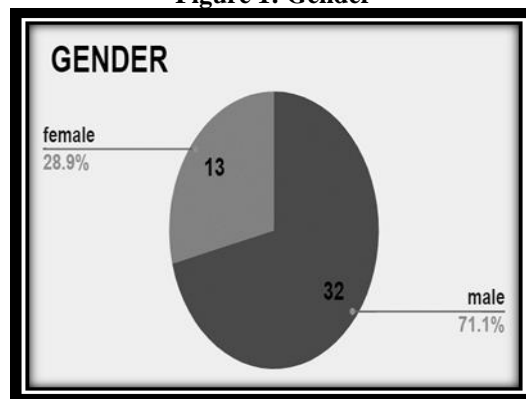


Figure 2: Level of injury

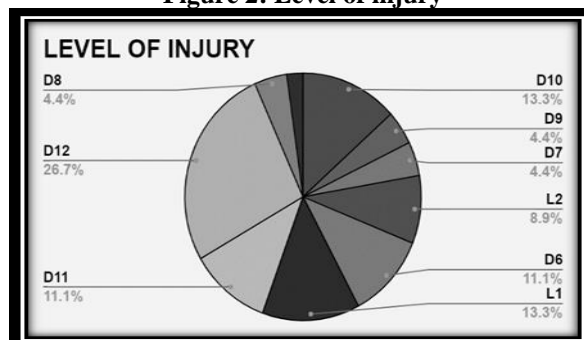


Figure 3: ASIA Scores

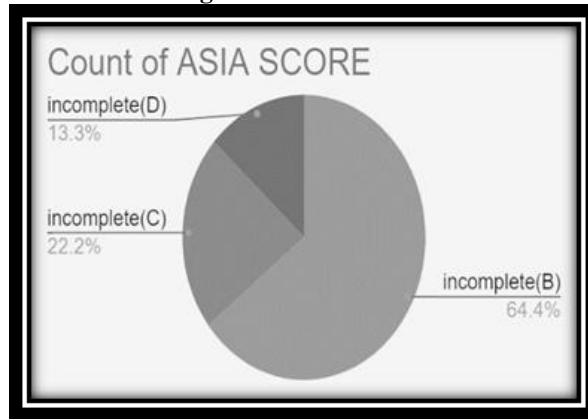
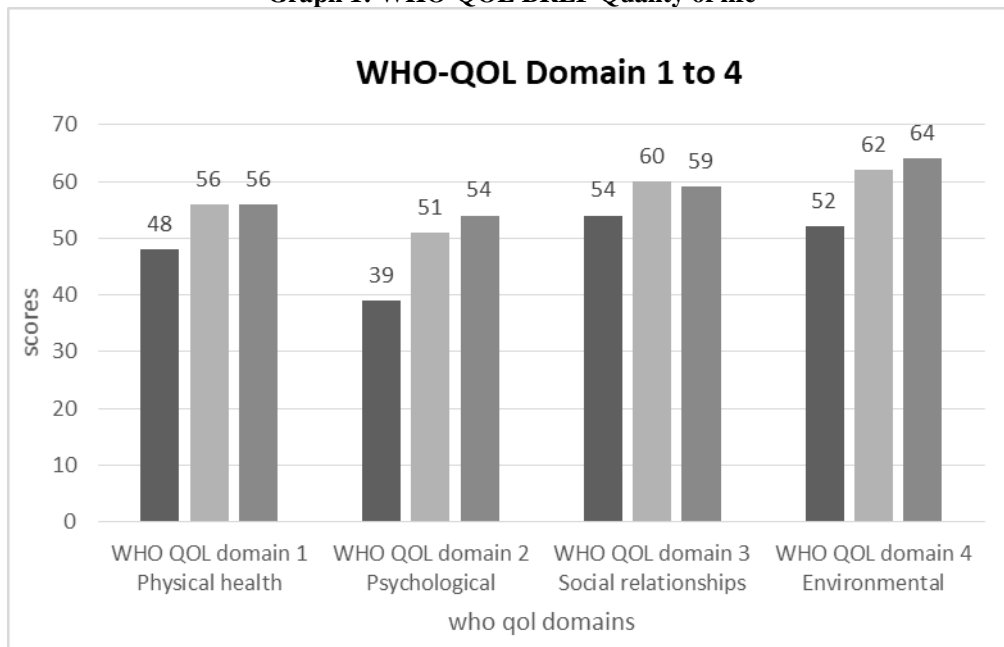


Table 2: WHO-QOL BREF Quality of life

DOMAINS	6 TO 12 MONTHS	STANDARD DEVIATION	1 TO 2 YEARS	STANDARD DEVIATION2	2 TO 3 YEARS	STANDARD DEVIATION3	P valve
WHO QOL domain 1 Physical Health	48	13.96	56	13.93	56	11.75	0.223
WHO QOL domain 2 Psychological	39	18.23	51	15.77	54	15	0.082
WHO QOL domain 3 Social Relationships	54	18.68	60	15.7	59	10	0.568
WHO QOL domain 4 Environmental	52	15.24	62	8.27	64	12	0.097

Graph 1: WHO-QOL BREF Quality of life

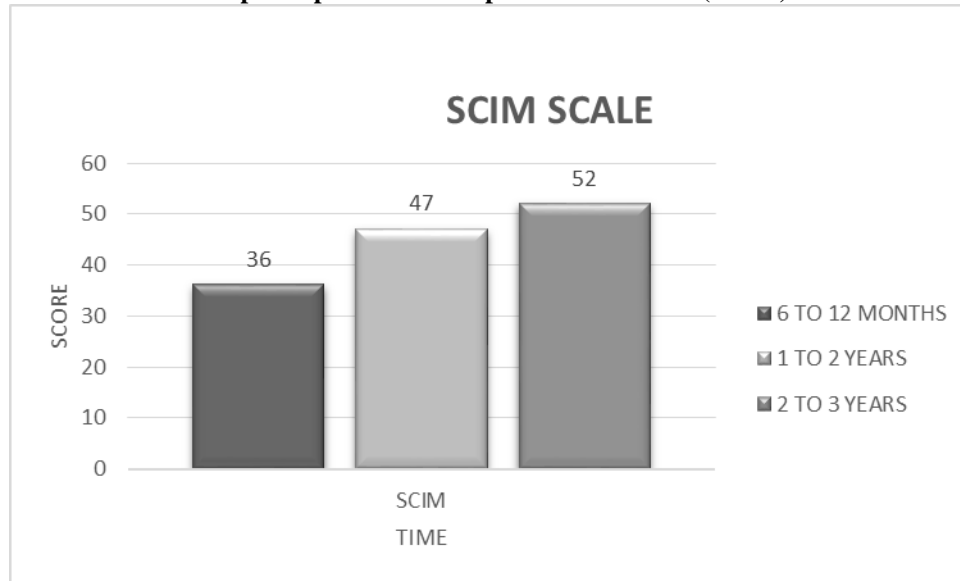


The above graph shows mean scores of 4 domains of WHO QOL at different time span

Table 3: Spinal cord independence measure (SCIM)

Column1	6 TO 12 MONTHS	STANDARD DEVIATION	1 TO 2 YEARS	STANDARD DEVIATION2	2 TO 3 YEARS	STANDARD DEVIATION3	P VALUE
SCIM	36	14.57	47	13.2	52	16	0.028

Graph2: Spinal cord independence measure (SCIM)



The above graph shows mean scores of SCIM scale at different time spans

DISCUSSION

This study illustrates checking whether or not the functional independence and quality of life in traumatic below T6 level spinal cord injury patients improves as time progresses. After interpreting the assessed data our study found out that there is significant improvement till the sub-acute phase and chronic post-injury (6 months to 2 years) while there is minimal to no improvement post that (in the chronic phase that is post 2 years). The reasons for this result can be many like SCI being a multi-system disorder, Quality of life being multi-dimensional, Secondary complications in the chronic stage of injury, Functional capacity being dependent on many different factors, psychological affection in traumatic SCI, Nature of injury (traumatic, sudden etc.), Time when rehabilitation started post-injury, Delayed diagnosis.

Spinal cord injury is a multisystem disorder that not only affects the neurological system but also many other systems like musculoskeletal, cardiopulmonary, integumentary, gastrointestinal, genitourinary, sensory etc. Research by Pollard C and team stated that in the acute stage, simultaneous good management of the multi-system impairments and malfunctions giving equal attention to all systems including that of the traumatized

spine is the key to good quality outcome¹⁶. Affection of these systems later leads to acute and or chronic complications which come in the way of improvement of quality of life and functional independence in patients in later stages post-injury.

As the quality of life is an individual's perception and so can differ from person to person. Also, it is not a unidimensional but a multidimensional process hence for improvement of quality of life as a whole focus should be put on improving all domains. Research done by James Middleton. et.al. stated that Persons with SCI were found to have a lower quality of life (QOL) compared with the general population. Low self-efficacy and pain intensity were found to reduce QOL across all domains even further. Factors such as completeness of lesion, sex, age at time of injury, and time since injury were not associated with reduced QOL¹⁷. Another study done by Leduc BE on a 2-year post-SCI population showed a significant decrease in the score of the eight health concepts as measured by the SF-36 as well as that of the physical component summary measure ($p < 0.05$). Analyzing the various medical and sociodemographic variables with the eight scales of the SF-36 indicate that younger age, employment and the lack of hospitalization in the previous year were

associated with a better quality of life. This study concluded that WHOQOL is decreased in the studied population with an SCI¹⁸.

A study done by Nebahat Sezer. et.al. in the year 2015 stated that acute and long-term secondary medical complications are common in patients with SCI. However, chronic complications especially further negatively impact patients' functional independence and quality of life. Therefore, prevention, early diagnosis and treatment of chronic secondary complications in patients with SCI are critical for limiting these complications and improving survival, community participation and health-related quality of life. The management of secondary chronic complications of SCI is also important for SCI specialists, families and caregivers as well as patients. The common secondary long-term complications after SCI, include respiratory complications, cardiovascular complications, urinary and bowel complications, spasticity, pain syndromes, pressure ulcers, osteoporosis and bone fractures. Therefore, it is important to be aware of the chronic complications of SCI and learn how to manage these complications for the recovery and rehabilitation process. Complications are a frequent cause of morbidity and mortality and lead to increased rates of rehospitalization, loss of employability decreased quality of life and reduced rate of functional improvement¹⁹.

The current study shows a gradual increase in functional capacity as time progresses, as improvement of functional capacity is not unidimensional but is dependent upon many other factors. A recent study was done by T O Wichmann. et.al. States TSCI patients with the greatest potential for functional recovery up to 1 year after injury seems to be patients who immediately after trauma present with few or no comorbidities and secondary complications, who sustain motor-incomplete injuries and who undergo early decompressive surgery²⁰. Early and continued physiotherapy also plays an

important role in steady progress in patients' functional capacity.

Psychological impact post-TSCI is one of the major problems faced during rehabilitation as it hampers the speed of progress and may slow it down. Research done by A Craig and team in 2008 suggested that approximately 30% of people with SCI are at risk of having a depressive disorder although in rehabilitation, and approximately 27% are at risk of having raised depressive symptoms when living in the community²¹. The review also established that people with SCI have higher comparative risks of anxiety disorder, elevated levels of anxiety, feelings of helplessness and poor quality of life (QOL). Hence psychological factors do play a role in deciding the rate and speed of improvement in SCI patients

Traumatic spinal cord injury is a sudden form of injury functional recovery post that is not dependent on only improvement of functional capacity but has many different aspects to it. A study done by MirHojjat Khorasanizadeh and team in 2018 stated that predicting neurological recovery following traumatic spinal cord injury (TSCI) is a complex task considering the heterogeneous nature of injury also neurological recovery after TSCI is significantly dependent on injury factors (i.e., severity, level, and mechanism of injury)²², Another research done by W O McKinley.et.al. Stated that the findings indicate that patients with nontraumatic SCI can achieve rates of functional gains and community discharge comparable with traumatic SCI²³. Whereas patients with traumatic SCI achieved greater overall functional improvement, patients with nontraumatic SCI had shorter rehabilitation lengths of stay and lower rehabilitation charges. Both these types of research are suggestive of the nature of injury plays a role in patients' prognosis and improvement as time progresses

Late rehabilitation post-injury or not knowing the importance of it can also lead to a bad prognosis, poor progress or

hampered improvement as time progresses. M Sumida and the team did a retrospective, multicenter study in 2001 on the importance of early rehabilitation and found out that Early SCI rehabilitation contributes to good physical activities of daily living for motor function 24. Another study was done by Giorgio Scivoletto et.al. In 2004 stated that early rehabilitation seems to be a relevant prognostic factor of functional outcome. [21] Rehabilitation intervention in patients with SCI should begin as soon as possible, in a specialized setting, because delay may adversely affect functional recovery. Hence both studies are suggestive that the time when rehabilitation is started post-injury is very crucial in deciding the prognosis or improvement in the later stages.

Thus, we can state that the quality of life and functional capacity in subjects from this study show stagnancy or very slow improvement in the chronic stage (post 2 years) while a very good and speedy recovery rate is seen in both the parameters till the sub-acute stage (6 months to 2 years post-injury)

CONCLUSION

Our study concludes that quality of life and functional capacity show a much better and significant improvement in the acute and sub-acute stage post-injury (6 months to 2 years) after which there is stagnancy observed or minimal improvement is seen.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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