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Functional Abilities and Health-related Quality of Life in Patients with Spinal Cord Injury: A Cross-sectional Study from a Rehabilitation Center in Nepal

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Abstract

Background: Spinal cord injury (SCI) significantly impairs physical function and health-related quality of life (HRQoL). Despite its growing burden, research on functional outcomes and HRQoL among SCI patients in developing countries, including Nepal, remains limited.

Methods: A descriptive cross-sectional study was conducted at the Spinal Injury Rehabilitation Center (SIRC), Nepal. All 85 eligible patients (aged 18–59 years) were enrolled using total enumeration. Functional ability was measured using the Spinal Cord Independence Measure version III (SCIM III), and HRQoL was assessed with the SF-36 survey. Association between variables was examined using the chi-square test, and Pearson correlation was used to assess the relationship between functional ability and HRQoL.

Results: The mean age was 36.34±11.79 years; 65.9% were male. Most respondents (92.9%) had paraplegia and 65.9% had incomplete SCI. Overall, 54.1% had good functional ability. Physical functioning was the most impaired HRQoL domain (mean 14.29±18.06), while social functioning was best preserved (56.62±30.41). Functional ability was significantly associated with age at injury (p=0.04), duration of injury (p=0.02), and level of injury (p=0.007). A moderate positive correlation was found between functional ability and HRQoL (r=0.34).

Conclusion: SCI patients in Nepal demonstrate substantially reduced HRQoL, particularly in physical domains. Functional ability is moderately correlated with HRQoL, underscoring the need for comprehensive multidisciplinary rehabilitation strategies that address physical, psychological, and social dimensions of recovery.

Keywords: Spinal Cord Injury, Rehabilitation, HRQoL

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Introduction

Spinal cord injury (SCI) is a serious condition that significantly affects life expectancy and quality of life and exacts a heavy economic toll.[1] SCI causes several health problems that negatively affect not only the patient's physical condition but all aspects of their lives, including their goals, communication, and, most importantly, their health-related quality of life (HRQoL).[2] Measuring HRQoL can help determine the burden of preventable disease, injuries, and disabilities, and can provide valuable insights into the relationships between HRQoL and risk factors.[3]

Rehabilitation is critical for individuals with SCI, facilitating both functional recovery and psychosocial reintegration. Key barriers to SCI rehabilitation include inadequate human resources for rehabilitation care, limited awareness among medical personnel and the general population, insufficient scientific evidence on rehabilitation outcomes, and high healthcare costs. Addressing these barriers is essential to ensure that individuals with SCI benefit from improved quality of life.[4]

It is well established that people with SCI experience both functional limitations and reduced HRQoL compared to the general population.[5] However, research on functional outcomes and HRQoL among SCI patients in Nepal and other developing countries remains limited. Regional data from Nepal suggest that the epidemiological and socioeconomic profile of SCI differs considerably from that reported in high-income settings,[6,7] highlighting the need for context-specific evidence. Therefore, this study aims to assess functional abilities and health-related quality of life among patients with SCI attending a rehabilitation center in Nepal.

Methods

Study Design

A descriptive cross-sectional study design was adopted for this study. The study was conducted at the Spinal Injury Rehabilitation Center (SIRC), a nonprofit and charitable center established in 2002 under Spinal Injury Sangha Nepal and registered with the Ministry of Health. SIRC was established with the aim of rehabilitating spinal injured individuals in Nepal. Data were collected over a period of four weeks.

Ethical Approval and Patient Consent

Ethical approval was obtained from the Institutional Review Committee (IRC) of B.P. Koirala Institute of Health Sciences (BPKIHS). Permission to collect data was obtained from SIRC, Sangha, Kavre. Written and verbal informed consent was obtained from all participants. All data were used exclusively for research purposes. Interviews were conducted in private settings and confidentiality was maintained throughout. The study adhered to the ethical principles of the IRC.

Patients were eligible for inclusion if they met the following criteria: (1) aged 18 to 59 years at the time of screening; (2) a clinically documented diagnosis of either traumatic or non-traumatic spinal cord injury (SCI); (3) a clinically stable health status, defined as the absence of acute illness or active infection at the time of recruitment; and (4) demonstrated willingness to participate as evidenced by providing written informed consent.

Sample Size and Sampling Technique

The sample size was 85, and a total enumeration technique was used, enrolling all eligible patients present at SIRC during the study period. A formal power analysis was not conducted; the sample represents the complete accessible population at the study site during the data collection period.

Data Collection Tools

A semi-structured, self-administered questionnaire incorporating two validated instruments was used. Functional ability was measured using the Spinal Cord Independence Measure version III (SCIM III), which covers three domains: self-care, respiration and sphincter management, and mobility. HRQoL was assessed using the SF-36 Health Survey, which evaluates eight domains including physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. Both tools were administered in Nepali. The SCIM III has been used in Nepali SCI populations in prior studies, and the SF-36 Nepali version has been validated for use in Nepal. Instrument selection was guided by review of relevant literature and consultation with subject experts.

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to characterize sociodemographic and disability-related variables. The chi-square test was used to examine associations between dependent and independent variables. Pearson correlation was used to assess the relationship between total SCIM III score and overall HRQoL score.

Results

Table 1 presents the complete sociodemographic profile. The mean age of respondents was 36.34 ± 11.79 years (range: 18–59 years), with the majority being male (65.9%). Regarding ethnicity, approximately half (50.6%) were Brahmin/Chhetri, and most (76.5%) practiced Hinduism. More than half of the respondents (68.2%) were married.

Almost all respondents (92.9%) had paraplegia, and the majority (65.9%) sustained an incomplete SCI. Most participants (68.2%) had been injured for one year or less, and 57.6% were hospitalized for less than one month. The majority (61.2%) stayed at the rehabilitation center for one to six months following injury.

Table 1. Sociodemographic Characteristics (n=85)

Characteristics	Frequency	Percentage (%)
Age (years): Mean ± SD	36.34 ± 11.79	
Range	18–59	
Gender		
Male	56	65.9
Female	29	34.1
Ethnicity		
Brahmin/Chhetri	43	50.6
Janajati (Hill/Terai)	36	42.4
Dalit (Hill/Terai)	6	7.1
Religion		
Hinduism	65	76.5
Buddhism	13	15.3
Christianity	7	8.2
Marital Status		
Married	58	68.2
Unmarried	24	28.2
Widow/Widower	2	2.4
Divorced	1	1.2
Educational Status		
Illiterate	9	10.6
Can read and write	13	15.3
Primary	22	25.9
Secondary and above	41	48.2
Employment Status		
Employed	10	11.8
Unemployed	75	88.2

Table 2. Disability-related Characteristics (n=85)

Variable	Frequency	Percentage (%)
Age at Injury		
20 years or younger	15	17.6
More than 20 years	70	82.4
Duration of Injury		
1 year or less	58	68.2
1–4 years	17	20.0
5–10 years	6	7.1
More than 10 years	4	4.7
Level of Injury		
Paraplegia	79	92.9
Quadriplegia	6	7.1
Severity of Injury		
Complete	29	34.1
Incomplete	56	65.9
Length of Hospital Stay		
Less than 1 month	49	57.6
1–6 months	25	29.4
6 months–1 year	8	9.4
More than 1 year	3	3.5
Length of Stay at Rehabilitation Center		
Less than 1 month	26	30.6
1–6 months	52	61.2
6 months–1 year	4	4.7
More than 1 year	3	3.5

Table 3. Mean Scores of SCIM III Domains (n=85)

SCIM III Domain	Mean ± SD	Range
Self-care	10.80 ± 7.28	0–20
Respiration and Sphincter Management	22.75 ± 9.16	10–40
Mobility	9.15 ± 7.41	0–26
Total Score	42.71 ± 21.64	10–82

Table 4. Functional Ability Categories by Domain (n=85)

SCIM III Domain	Poor Functional Ability n (%)	Good Functional Ability n (%)
Self-care	35 (41.2)	50 (58.8)
Respiration and Sphincter Management	48 (56.5)	37 (43.5)
Mobility	42 (49.4)	43 (50.6)
Total Functional Ability	39 (45.9)	46 (54.1)

Mean SCIM III domain scores are presented in Table 3. The highest mean score was observed in the respiration and sphincter management domain (22.75 ± 9.16), while mobility had the lowest score (9.15 ± 7.41). Overall, 54.1% of respondents demonstrated good functional ability and 45.9% had poor functional ability. Table 4 presents functional ability categorization by domain.

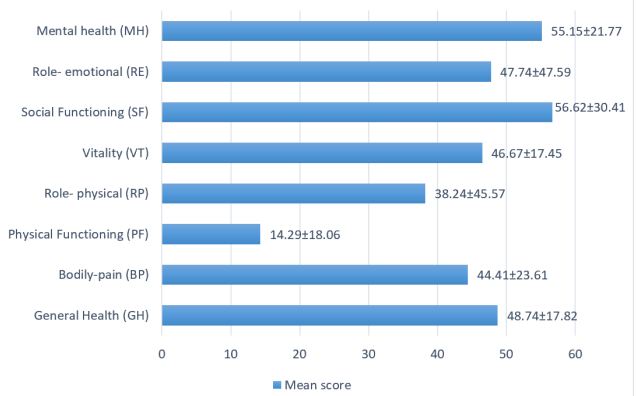


Figure 1 Mean Score of Different Domains of Health-Related Quality of Life

SF-36 domain scores are shown in Figure 1. Social functioning had the highest mean score (56.62 ± 30.41), while physical functioning had the lowest (14.29 ± 18.06). Overall, more than half of respondents (50.6%) had lower HRQoL following SCI.

Table 5 presents associations between overall functional ability and disability-related characteristics. Statistically significant associations were found with age at injury (p=0.04), duration of injury (p=0.02), and level of injury (p=0.007). Severity of injury, length of hospital stay, and length of stay at the rehabilitation center were not significantly associated with overall functional ability.

Table 6 presents associations between HRQoL domains and disability-related characteristics. A significant association was found between age at injury and role-physical (p=0.04). Duration of injury was significantly associated with physical functioning (p<0.001), role-physical (p<0.001), vitality (p<0.001), social functioning (p=0.02), and role-emotional (p<0.001). Role-physical was also significantly

Table 5. Association between Functional Abilities and Disability-related Characteristics (n=85)

Characteristic	Poor Functional Ability	Good Functional Ability	p-value
Age at Injury			
≤20 years	3	12	0.04*
>20 years	36	34	
Duration of Injury			
1 year or less	32	26	0.02*
More than 1 year	7	20	
Level of Injury			
Paraplegia	33	26	0.007*
Quadriplegia	6	0	
Severity of Injury			
Complete	16	13	0.25
Incomplete	23	33	
Length of Hospital Stay			
≤1 year	26	23	0.13
>1 year	13	23	
Length at Rehabilitation Center			
≤1 year	37	41	0.45
>1 year	2	5	

Table 6. Association between HRQoL Domains and Disability-related Characteristics (n=85)

Characteristic	GH	BP	PF	RP	VT	SF	RE	MH
Age at injury	1.00	1.00	0.15	0.04*	0.26	0.39	0.39	0.17
Duration of injury	0.82	1.00	<0.001*	<0.001*	<0.001*	0.02*	<0.001*	0.24
Level of injury	0.68	1.00	0.07	1.00	0.40	1.00	0.69	0.39
Severity of injury	0.36	0.82	0.35	1.00	0.37	0.65	0.82	0.82
Length of hospital stay	0.39	0.26	0.12	0.04*	0.83	0.67	0.38	1.00
Length at rehab center	0.70	1.00	0.01*	0.02*	0.23	0.70	0.12	0.13

(GH: General Health; BP: Bodily Pain; PF: Physical Functioning; RP: Role-Physical; VT: Vitality; SF: Social Functioning; RE: Role-Emotional; MH: Mental Health. * p≤0.05)

associated with length of hospital stay (p=0.04) and length of stay at the rehabilitation center (p=0.02).

Correlation between Functional Abilities and HRQoL

A moderate positive correlation was found between total SCIM III score and overall HRQoL (r=0.34), indicating that higher functional ability is associated with better quality of life among SCI patients.

Discussion

Sociodemographic Characteristics

The mean age of respondents was 36.34 ± 11.79 years (range 18–59), with the majority being male (65.9%). This finding is consistent with SCI epidemiology in both developed and developing countries, where working-age males are disproportionately affected.[6] In Nepal, males are more likely to undertake physically demanding activities such as agricultural labor, construction, and work at height, increasing their risk of fall-related SCI.7 In contrast, women are more commonly engaged in home-based activities, which may partly explain their lower representation in this cohort.

Most respondents (89.4%) were literate, yet unemployment was high (88.2%), consistent with findings from Gautam et al. (2019) in which 92.2% were literate but 51.5% were unemployed.5 The gap between literacy and employment among SCI patients may reflect health-related barriers at baseline, including pressure ulcers and reduced physical capacity, which have been identified as major barriers to workforce participation in prior research.[8]

Disability-related Characteristics

Most respondents (82.4%) sustained injury after the age of 20 years. Almost all (92.9%) had paraplegia, with only 7.1% having quadriplegia. This pattern is consistent with Gautam et al. (2019), in which 93.2% of a similar Nepali sample had paraplegia.[5] The predominance of paraplegia over quadriplegia may reflect the typical mechanisms of SCI in Nepal, including falls from heights and farming-related accidents, which more commonly affect the thoracic and lumbar spine.

Functional Abilities

Using the SCIM III, mobility was the most impaired domain, followed by self-care, while respiration and sphincter management achieved the highest mean score (22.75 ± 9.16). This pattern is broadly consistent with findings from Khatri et al. in Nepal[9] and with a Netherlands-based study that similarly reported higher scores in the respiration and sphincter management domain.[10] The relatively preserved respiratory and sphincter function in our cohort likely reflects the predominance of incomplete and lower-level injuries (paraplegic patients). More than half (54.1%) demonstrated good overall functional ability.

Significant associations were found between overall functional ability and age at injury (p=0.04), duration of injury (p=0.02), and level of injury (p=0.007). Younger patients and those injured more recently tended to have better functional outcomes, consistent with established neuroplasticity principles. As expected, paraplegic patients had better functional outcomes than those with quadriplegia, given the greater preservation of upper limb function. Severity of injury, length of hospital stay, and rehabilitation stay were not significantly associated with overall functional ability, although functional recovery following incomplete SCI is highly variable and depends on individual neurological and rehabilitative factors.[11]

Health-related Quality of Life

Overall, 50.6% of respondents rated their HRQoL as below average following SCI. This is consistent with findings from Iran, where a systematic review and meta-analysis reported substantially impaired HRQoL in SCI patients.[12] Physical functioning was the most severely affected domain (mean 14.29 ± 18.06), similar to findings reported in a prior study where respondents scored very low (16.1) on the same domain.[13] This degree of physical impairment is not unexpected, given the well-documented secondary

complications of SCI, including cardiovascular disease, bladder and bowel dysfunction, pain syndromes, pressure ulcers, and osteoporosis.[14]

Social functioning was the best-preserved HRQoL domain (mean 56.62 ± 30.41), a finding consistent with previous studies from Iran.[15] This may reflect the sustained role of social support networks and community engagement even in the presence of physical disability, and may be reinforced by culturally embedded family support structures in Nepal. Duration of injury was significantly associated with physical functioning, vitality, social functioning, and role-emotional. Length of rehabilitation stay was associated with physical functioning and role-physical. These associations suggest that longer rehabilitation exposure contributes to improvements in physical and functional HRQoL domains, supporting the value of sustained rehabilitation input. However, the cross-sectional nature of this study limits causal interpretation. The literature on the relationship between time since injury and HRQoL is mixed; some studies report no significant correlation, while others identify a positive association, with some longitudinal evidence suggesting that HRQoL may stabilize initially but decline in later years.[16]

Correlation between Functional Abilities and HRQoL

A moderate positive correlation (r=0.34) was observed between total SCIM III score and overall HRQoL. This is in line with previous literature; Tramonti et al.16 reported a larger correlation (r=0.72, p<0.001) between SCIM III total score and the SF-36 physical functioning subscale in a sample of 40 SCI patients, suggesting that the strength of this relationship may be amplified when examining specific functional and HRQoL domains. The moderate correlation in our sample may reflect the multidimensional nature of HRQoL, which encompasses psychological, social, and emotional factors beyond physical function.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design precludes conclusions about causal relationships or longitudinal changes in functional ability and HRQoL. Long-term follow-up after community reintegration was not possible within the study period. Second, the study was conducted at a single rehabilitation center, which may limit generalizability to SCI patients in other settings or those not seeking formal rehabilitation. Third, important secondary complications of SCI, such as pressure ulcers and urinary tract infections, were not systematically captured, which may have influenced reported outcomes. Future studies should incorporate longitudinal designs, multi-site recruitment, and a broader clinical assessment.

Conclusion

This study demonstrates that SCI patients attending a rehabilitation center in Nepal experience substantial impairments in both functional ability and HRQoL, particularly in physical functioning and mobility domains. A moderate positive correlation between functional ability and HRQoL (r=0.34) underscores the importance of optimizing independence in activities of daily living as a pathway to improved quality of life. Key disability-related factors including age at injury, duration of injury, and level of injury were significantly associated with functional outcomes, while duration of injury and rehabilitation stay influenced multiple HRQoL domains. These findings support the need for comprehensive, multidisciplinary rehabilitation that addresses not only physical recovery but also psychological support, social integration, and socioeconomic reintegration. Longitudinal and multicentre studies are needed to further elucidate the long-term dynamics of these relationships and evaluate the efficacy of targeted interventions.

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