

Frequency of Neck Disability Among Manual Wheelchair Users Having Injury of Spinal Cord; A Cross Sectional Study

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Author's Contribution

¹Concept and data collection, ²Concept and drafting, ³Critical revision and final approval, ⁴Data collection and drafting of article, ⁵Data analysis and critical revision, ⁶Data analysis and final approval.

Article Info.

Received: June 18, 2023

Acceptance: April 15, 2024

Conflict of Interest: None

Funding Sources: None

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Cite this article as Farooq A, Safdar N, Asim HM, Shehzadi S, Salik S, Faisal S.

Frequency of Neck Disability Among Manual Wheelchair Users Having Injury of Spinal Cord; A Cross-Sectional Study. JRCRS. 2024; 12(2):70-74.

<https://dx.doi.org/10.53389/JRCRS.2024120202>

A B S T R A C T

Objective: To determine frequency of neck disability among spinal cord injured patients prone to used manual wheelchairs.

Methodology: A descriptive cross-sectional was executed after Ethical Approval from the LMDC committee from November 2022 to April 2023. The study was conducted in Gurkhi Trust & Teaching Hospital and Lahore General Hospital, Lahore; engaging 65 patients aged 25-50 years with traumatic paraplegic spinal cord injuries, using manual wheelchairs for 3 to 12 months. The study excluded individuals with systemic or degenerative diseases, neck pain resulting from whiplash injury, and those exhibiting medical red flags. Non-probability convenience sampling helps for selection and Neck Disability Index (NDI) used for data collection. SPSS version 26 used for statistical purposes.

Results: Out of 65 patients, 66.7% (n=44) were males and 31.8% (n=21) were females. The mean age of study subjects was 37.00±9.394 years. The Total Score of the Neck Disability Index showed with mean of 24.78 8.58 years. Hence the percentage of neck disability demonstrated in 65 patients was 3.0% (n=2) with no disability, 9.1% (n=6) mild disability, 30.3% (n=20) moderate disability, 42.4% (n=28) severe disability, 13.6% (n=9) complete disability. Out of 65 patients, 42.4% (n=28) were with severe disability. However; there was no significant association of developing neck disability among spinal cord injury patients with prolonged use of Manual wheelchairs with a p-value <0.05.

Conclusion: The study findings indicate a significant frequency of severe neck disability among users of manual wheelchair with traumatic injury of spinal cord without having any significant association with the duration of wheelchair usage.

Keywords: Disability, Manual Wheelchair, Neck, Spinal cord injury.

Introduction

Traumatic spinal cord injury (SCI) is an enervating condition of neurological system; producing has a significant impact on the socioeconomic life of affected people and the healthcare system.¹ Any injury to the spine, spinal cord, or any supporting structure in general is the consequence of a complex interaction of injuries sustained by musculoskeletal and nervous systems. The spinal column is responsible for supporting and protecting the spinal cord, its sheaths, and roots.² Consequently, a traumatic injury to the spine is very likely to affect its content

and, with it, produce notable neurological damage that can even become irreversible.^{3,4}

Neurological damage is classified as complete or incomplete, based on the involvement at the sacral level. Incomplete lesions and a favorable prognosis are associated with sphincter function and persistent perineal sensitivity.⁵ Lesions that are located at the higher level of spinal cord injury are associated with sympathetic autonomic dysfunction unlike the lower level of the spinal column in which parasympathetic autonomic functionality is compromised leading to priapism and loss of the functionality of the urinary and mobility is the conviction of

problem.^{6, 7} Restriction of mobility due to usage of wheelchair that is major concern among multiple patients suffered with chronic disorders of neurological system such as multiple sclerosis, stroke, and spinal cord injuries.⁸ In spite of these disease; prolonged usage and propulsion of manual wheelchairs produce greater load on the upper limbs. This load is evenly increased among the patients shaving any cervical spinal cord injuries. A manual wheelchair is delineated as a is operated either manually by patients or through the power motor device that accommodate the mobility issues for the primary function of any locomotion.⁹

Neck disability is a multifactorial disease and a major problem resulting in manual wheelchair users, particularly in paraplegic individuals. However neck disability may cause muscle spasms, muscle pain, headache, facet joint pain, nerve pain, referred pain, and bone pain, therefore neck discomfort is considered a major prevalent musculoskeletal problem in users of manual wheelchair with spinal cord injury.¹⁰ Liampas et al. concluded that neck discomfort and disability are highly associated with the seating posture of the person in a wheelchair. Neck slight flexion along with straight alignment helps in preventing painful flexion and rotation of the neck.⁸ Similarly, Kovacs et al. stated that highly thickened cushions of wheelchair seats further lead to neck disability.¹¹

However, multiple studies described the prevalence of different musculoskeletal disorders among manual wheelchair patients including shoulder pain, bicep pathology and groin pain but still, very limited studies focus on the alignment disturbance, pain and disability index of cervical spine or neck among manual wheelchair users. Therefore, the current study was designed to determine the frequency of neck disability among manual wheelchair users after spinal cord injury. In addition, this study will help physical therapists in making a preventive and therapeutic approach toward the neck while managing such patients and reducing the development of many postural and musculoskeletal pathologies.

Methodology

The study, characterized as a descriptive cross-sectional observational design, was conducted in Ghurki Trust & Teaching Hospital and Lahore General Hospital, Lahore; spanning from November 2022 to April 2023. This research received ethical approval from the Lahore College of Physical Therapy Ethical Board having a **Ref. No. LCPT 41**. A total of 65 participants were enlisted through the World Health Organization Sample Size Calculator with 95% CI, anticipated population proportion $p=0.16$ and absolute precision $d=0.03$ ⁽¹²⁾. The research focused on male and female paraplegic traumatic spinal cord injury patients, specifically those aged between 25

to 50 years, who were using manual wheelchairs from 3 months to 1 year. Exclusion criteria were set to omit patients with a history of systemic or degenerative diseases, neck pain resulting from whiplash injury, and those exhibiting medical red flags.

Participants were asked to complete the English version of the Neck Disability Index (NDI) questionnaire, which has an intraclass correlation coefficient of 0.86.¹⁴⁻¹⁵ This questionnaire consists of ten items that evaluate disability linked with neck or whiplash injury. The questionnaire includes ten questions in which four focused on intensity of pain, headache, concentration and sleep issues. The remaining six questions focused on ADLs from lifting to personal and professional questions. NDI had six options in which 0 means zero disability while 5 shoed maximum disability level. Summation of scores from total score of 50 scoring helps to rule out disability level. A score below 4 suggests no disability, 5–14 indicates mild, 15–24 signifies moderate, 25–34 implies severe disabilities levels, and scores exceeding 35 suggest complete disability⁽¹⁶⁾.

The assurance of anonymity and complete data protection was a priority, and this was communicated to all participants. Upon collection, the data was meticulously entered and analyzed using the Statistical Package for Social Sciences (SPSS), version 26. The findings were then presented in a comprehensive manner utilizing frequency tables and pie charts ensuring a clear and detailed understanding of the results.

Results

The result of the current study was described in tabulated and figure form. *Table I* shows the results of demographic variables in which the mean age was 37.00 ± 9.39 with 25 years being the minimum age and 50 years being the maximum. The gender distribution was described in *Table I*, among 65 patients, 68% ($n=44$) were males and 32% ($n=21$) were females. Furthermore, the frequency of the neck disability index was described in the form of percentages in *Table I*. The current study found that in 65 patients with traumatic spinal injury, 3.0% ($n=2$) reported no

Table I: Demographic variables of participants.

Variables		N (%)
Age		
Gender	Male	44 (68%)
	Female	21 (32%)
NDI %	0-8% (no disability)	2 (3%)
	10-28% (mild disability)	6 (9.1%)
	30-48% (moderate disability)	20 (30.3%)
	50-69% (severe disability)	28 (42.2%)
	70-100% (complete disability)	9 (13.6%)
Duration of wheelchair usage	3-6(months)	7 (10.8%)
	7-9(months)	25 (38.5%)
	10-12(months)	33 (50.8%)

disability, 9.1% (n=6) mild disability, 30.3% (n=20) moderate disability, 42.4% (n=28) severe disability, 13.6% (n=9) complete disability. Out of 65 patients, 42.4% (n=28) were with severe disability on the Neck Disability Index (NDI).

Table II: Frequency of Subjective Symptoms in Neck Disability Index Questionnaire.

Neck Disability Index (NDI)			
Items Related to	Questions	Responses	N (%)
Subjective Symptomatology	Pain Intensity	No pain	13(19.7%)
		Very mild	18(27.3%)
		Moderate	16(24.2%)
		Fair severe	10(15.2%)
		Very severe	8(12.1%)
	Personal care (washing, dressing, etc.)	Look after me without extra pain	8(12.1%)
		Look after myself but causes extra pain	14(21.2%)
		Painful to look after myself	21(31.8%)
		Need some help	10(15.2%)
		Need help everyday	9(13.6%)
		Do not get dressed	3(4.5%)
	Lifting	Lift weight without extra pain	1(1.5%)
		Lift weight with extra pain	6(9.1%)
		Pain in lifting weight off the floor	5(7.6%)
		Pain in lifting but manages light to medium-weight	15(22.7%)
		Lift very lightweight	28(42.4%)
	Reading	Cannot lift the weight	10(15.2%)
		Can read with no pain	13(19.7%)
		Can read with slight pain	21(31.8%)
		Can read with moderate pain	13(19.7%)
		Can't read with moderate pain	11(16.7%)
		Can hardly read with severe pain	5(7.6%)
		Cannot read	2(3%)

Neck Disability among patients with spinal cord injury was assessed with NDI as shown in Tables II and III. These tables showed the NDI items related to subjective symptomatology and activities of daily living. *Table II* shows that in questions related to subjective symptomatology, 27.3% (n=18) reported mild pain, 31.8%(n=21) reported pain in personal care, 42.4%(n=28) could lift light weights and 31.8%(n=21) can do reading without any pain. *Table III* shows that in questions related to activities of daily living, 40.9%(n=27) reported slight headaches infrequently, 37.9%(n=25) reported slight difficulty in concentration, 33.3%(n=22) stated they feel neck pain after much work, 75.8%(n=50) cannot drive due to neck pain, 34.8%(n=23) reported sleeping moderately disturbed and

51.5%(n=34) can hardly do recreational activities without any pain.

Additionally; the association of neck disability with duration of usage of manual wheelchair was described in *Table 4*. The result showed that in 7 patients using Manual wheelchairs from 3-6 months, only 4 had a severe disability; in 25 patients using from 7-9 months; 10 had moderate disability, 8 had severe disability and 5 had complete neck disability. Similarly; 33 patients were using a wheelchair from 10-12 months of which 9 had moderate disability, 16 had severe disability and 3 had complete neck disability. Additionally; the table further concluded that a total of 20 patients faced moderate disability and 28 had severe neck disability; still the Chi-square value was 6.098 with a p-value of 0.636 showing that there was no significant association between the neck disability and manual Wheelchair usage among Spinal cord injury patients.

Discussion

Spinal cord injuries (SCI) is a pathological condition having different and complicated characteristics producing negative consequences on life modifications. Hence the current cross-sectional study which illustrated the frequency of neck disability among manual wheelchair users with spinal cord injury merely in sixty-five paraplegic patients in addition to having more severe disability cooperated in them. According to this, its results are consistent with the previous study. The previous study that was conducted by Ali Hassan et al reported exercises protocols are effective in managing the patients using wheelchairs due to spinal cord injury in the refugee camp of war. The study established the hypothesis that strengthening exercises of upper limb, scapula and trunk during rehabilitation of the wheelchair users help in correcting posture especially of neck and head, increasing capacity, and reducing fatigue and neck disability by using the questionnaire in association with the study.¹³

Another study that was conducted by Francisco M. Kovacs et al who determined the occurrence and factors among users of manual wheelchair. Hence the study involved patients with neck pain, thoracic pain, and lower back pain in which spinal pain is 52% as neck pain, 51% as thoracic pain and 41% as lower back pain showed that neck disability is more common in people with spinal cord using manual wheelchair. The results of the study were that there are some risk factors associated with spinal pain and that the thickness of the seat cushion affects neck pain.¹¹ In contrast, the current study elaborated that in the range of 50-60% with severe disability showed more neck disability among wheelchair users with males at a greater ratio than females so there is a consistent with the results that 52%

of neck pain could be the cause of disability and participation restrictions for an individual.

In the previous study; head along with trunk movements greatly enhanced according the propulsion speed of wheelchair over the ground in tetraplegic patients by Marie S.¹⁴ Similarly, Julien et al. included seven adults in a study in which five were men and two were women suffering from neck pain. Participants propelled at different speeds over the ground while the video captured the kinematic data of the participants. Variables that were included were forward and lateral flexion along with axial rotation of head and trunk along with

neck pain. Therefore the results elaborated that trunk muscles weakness are highly compensate by flexing the upper trunk and neck forward during manual wheelchair propulsion and movements increase with speed in such patients.¹⁵ In contrast to the current study which merely involved paraplegic patients that propelled the manual wheelchair with spinal cord injury in addition to having consequences with severe disability and included sixty-five patients.

Table III: Frequency of Activities of Daily Living in Neck Disability Index Questionnaire.

Neck Disability Index (NDI)			
Items Related to	Questions	Responses	N (%)
Activities Of Daily Living	Headaches	No headaches	11(16.7%)
		Slight headaches infrequently	27(40.9%)
		Slight headaches frequently	18(27.3%)
		Moderate headaches infrequently	3(4.5%)
		Severe headaches frequently	6(9.1%)
		Headaches almost all the time	0(0%)
	Concentration	No difficulty	22(33.3%)
		Slight difficulty	25(37.9%)
		A fair degree of difficulty	10(15.2%)
		A lot of difficulty	4(6.1%)
		A great deal of difficulty	2(3.0%)
		Cannot concentrate	2(3.0%)
	Work	Much work	22(33.3%)
		Only usual work	11(16.7%)
		Most of the usual work	17(25.8%)
		Cannot do usual work	4(6.1%)
		Can hardly do any work	8(12.1%)
		Can't do any work	10(15.2%)
	Driving	Drive without pain	2(3.0%)
		Drive with slight pain	3(4.5%)
		Drive with moderate pain	0(0%)
		Can't drive with moderate pain	2(3.0%)
		Hardly drive with severe pain	7(10.6%)
		Can't drive	50(75.8%)
	Sleeping	No trouble	1(1.5%)
		Slightly disturbed (1hr)	13(19.7%)
		Moderately disturbed (1-2hrs)	7(10.6%)
		Moderately disturbed (2-3hrs)	23(34.8%)
		Greatly disturbed (3-4hrs)	18(27.3%)
		Completely disturbed (5-7hrs)	3(4.5%)
	Recreation	Engage in activities with no pain	2(3.0%)
		Engage in activities with some pain	7(10.6%)
		Engage in most activities with pain	3(4.5%)
		Engage with a few activities with pain	6(9.1%)
		Hardly do activities with pain	34(51.5%)
		Can't do any activities	13(19.7%)

Table IV: Association of Neck disability with Manual wheelchair usage duration.

		NDI					Total	Chi-square	p-value
		0-8 % (no disability)	10-28% (mild disability)	30-48% (moderate disability)	50-69% (severe disability)	70-100% (complete disability)			
Duration	3-6(months)	0	1	1	4	1	7	6.098	0.636
	7-9(months)	0	2	10	8	5	25		
	10- 2(months)	2	3	9	16	3	33		
Total		2	6	20	28	9	65		

There was an old study related to neck pain among wheelchair users conducted by Michael L. Boninger et al who investigated the significance of neck pain in wheelchair users and to determine if a portion of neck pain is due to myofascial release including both paraplegia and tetraplegia and check the vibrations and propulsion of wheelchair. The frequency showed that in sixty-six subjects only 40% with limited daily living activities while 60% with neck pain and 54% with trigger point palpation responded to the questionnaire which is Neck Disability Index with a mean of 31.2 years and standard deviation of 15.4 years.¹⁶ In comparison to current study showed the consequences of neck disability among paraplegic spinal cord manual wheelchair users with the 50-60% range of disability causes a severe disability among patients and affects the modifications and activity of daily living of individuals using wheelchairs. Therefore, further studies should focus more on position and other factors that could be the consequences of disability in wheelchairs.

Limitation & Recommendations: The study had some drawbacks. Primarily, the study only concentrated on the frequency and association of neck disability and duration of Manual wheelchair users in patients. There is a lack of determination of any cause or risk factor and their association with neck disability. It is recommended that a further detailed study be conducted to find out the definite risk factors of neck disability and its association. Secondly, the study was conducted on a small sample size within two hospitals. Therefore, a detailed study would be conducted in multiple hospital setups on a larger sample for a better understanding of the neck disability.

Conclusion

The study concluded that manual wheelchair users suffer from moderate to severe neck disability after spinal cord injury. This disability depends on the duration of wheelchair usage as longer the duration will be the neck disability but the duration of usage is not an important risk factor for developing neck disability among Manual wheelchair users after Spinal cord injury.

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