

# Prevalence and Level of Depression and its Co-Relation with Various Factors Following Traumatic Spinal Cord Injury

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**Abstract:** ***Aim:** To find out the prevalence and level of depression and to co-relate its occurrence with Age of patient, Level of injury and Time duration of injury following traumatic Spinal Cord Injury. **Methodology:** All the subjects will be explained about the purpose and the procedures of the study & written informed consent will be obtained from all participants. **Result:** Significant Results were obtained. **Conclusion:** This study supports a shorter and more streamlined approach to screening for depression after SCI.*

**Keywords:** Traumatic; Spinal Cord; Injury; Depression

## 1. Introduction

The spinal cord is the major conduit through which motor and sensory information travels between the brain and body. The spinal cord contains longitudinally oriented spinal tracts (white matter) surrounding central areas (gray matter) where most spinal neuronal cell bodies are located. The gray matter is organized into segments comprising sensory and motor neurons. Axons from spinal sensory neurons enter and axons from motor neurons leave the spinal cord via segmental nerves or roots.<sup>1</sup> Spinal cord injury (SCI) affects conduction of sensory and motor signals across the site of lesion, as well as the autonomic nervous system.<sup>1</sup> A case of spinal cord injury is defined as the occurrence of an acute traumatic lesion of neural elements in the spinal canal (spinal cord and cauda equina), resulting in temporary or permanent sensory and/or motor deficit. The clinical definition of spinal cord injury excludes intervertebral disc disease, vertebral injuries in the absence of spinal cord injury, nerve root avulsions and injuries to nerve roots and peripheral nerves outside the spinal canal, cancer, spinal cord vascular disease, and other non-traumatic spinal cord diseases.<sup>2</sup>

Depression is associated with longer lengths of hospital stay and fewer functional improvements as well as functional independence and poorer mobility at discharge.<sup>3</sup> Depression is associated with the occurrence of pressure sores and urinary tract infections, poorer self appraised health, less leisure activity, poorer community mobility and social integration and fewer meaningful social pursuits.<sup>3</sup> Persons with SCI and significant depression spend more days in bed and fewer days outside the home, require greater use of paid personal care and incur greater medical expenses.<sup>3</sup> Moreover symptoms consistent with depression, such as documented expression of despondency, hopelessness, shame, and apathy are the variables most predictive of suicide 1 to 9 years after SCI.<sup>3</sup>

Factors found to predict or place individuals at risk for depression include greater severity of handicap, lack of autonomy, presence of severe complications, fewer years of

education, greater number of hours spent in bed, degree of self-perceived handicap, younger age, being unmarried, pre-injury psychiatric or psychological issues such as substance abuse, inadequate coping abilities, pain, lower activity patterns, frequent alcohol use post-injury, insufficient personal assistance, somatic symptoms, divorce, unemployment, pressure sores, low self-rated adjustment to disability, and neurological deficits.<sup>4</sup>

Researchers have also identified several factors related to positive changes in post-injury levels of depression including adequate social support and negative changes in post injury depression including changes in level of pain.<sup>4</sup> Treatment modalities such as cognitive-behavioral therapy, social skills training, assertiveness training, and participation in sports activities have also been correlated with positive changes in level of depression among persons with SCI.<sup>4</sup>

Exercise has been shown benefit patients with mild to moderate mood disorders, especially anxiety and depression. When performing aerobic exercise your body releases endorphins from the pituitary gland which are responsible for relieving pain and improving mood. These endorphins can also lower cortisol levels which have been shown to be elevated in patients with depression. Additionally, exercise increases the sensitivity of serotonin in the same way antidepressants work, allowing for more serotonin to remain in the nerve synapse. Exercise can be aerobic or resistive in nature, as both have been shown to be beneficial in a variety of patient types. Anyone with depression can participate in an exercise program no matter how old or young they are, as long as proper supervision is provided. Exercise is an excellent option for treatment when taking anti-depressants is not an option due to their side effects. Depression symptoms can be decreased significantly after just one session but the effects are temporary. An exercise program must be continued on a daily basis to see continued effects. As a person continues to exercise they may experience changes in their body type which can help to improve self esteem and body image issues they may have been having.

## 2. Subjects and Methods

The Patient Health Questionnaire-9 (PHQ-9) is a depression measure based on the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* criteria for major depressive disorder.<sup>24</sup>

The PHQ-9 is a self-report measure that asks subjects how often they have been bothered by the following problems in the past 2 weeks: (1) little pleasure or interest in doing things; (2) feeling down, depressed, or hopeless; (3) sleeping too little or too much; (4) feeling tired or having little energy; (5) poor appetite or overeating; (6) feelings of worthlessness or guilt; (7) concentration problems; (8) psychomotor retardation or agitation; and (9) thoughts of suicide. Subjects were asked to rate how often each symptom occurred: 0 (not at all), 1 (several days), 2 (more than half the days), or 3 (nearly every day).<sup>5,6</sup> Items are rated, based on their occurrence during the past 2 weeks, from 0 (not occurring at all) to 3 (occurring nearly every day). The PHQ-9 has good internal consistency (Cronbach .87) and construct validity.<sup>8,9</sup> We used the total score (range, 0–27) to describe depression severity, and a score of 10 or more to indicate probable major depression. The PHQ-9 has excellent internal and test-retest reliability as well as criterion and construct validity in medical samples.<sup>6</sup> The PHQ-9 has been used extensively in SCI samples.<sup>10,7,8,11,12</sup> and has been validated for telephone administration.<sup>13,14</sup>

### Interpretation of Total Score

Total Score	Depression Severity
1 – 4	Minimal depression
5 – 9	Mild depression
10 – 14	Moderate depression
15 – 19	Moderately severe depression
20 – 27	Severe depression

On the first visit, a complete assessment was done. Subjects who were found suitable for the participation in the study according to inclusion and exclusion criteria were requested to sign consent forms. All the subjects were explained about the purpose and the procedures of the study & written informed consent was obtained from all participants. All participants gave informed consent for data collection. Initial demographics and injury – related characteristics included etiology of injury, injury level, time since SCI, injury severity were based on self report interviews and physical examinations and hospital records near the time of a person's initial rehabilitation hospitalization. Neurologic injury was classified by *International Standards for Neurological Classification of Spinal Cord Injury* developed by the American Spinal Injury Association (ASIA). The ASIA Impairment Scale was used to classify injury severity into complete (ASIA grade A) and incomplete (ASIA grade B – E). Assessment chart which included Personal information, chief complains, observational and examination findings. In general identification information related to Name, Age, Sex, Address & Occupation were taken. Patients were noted for their PHQ – 9 score by Patient Health Questionnaire – 9.

## 3. Discussion

In this study, the prevalence of Probable MDD was 40 % in sample of people with SCI. The rate of probable MDD detected in this sample is consistent with the rates found in previous studies of MDD among people with SCI. Major depression rates found in studies that used DSM diagnostic criteria range widely, from about 9.8% to 37.5% , although most estimates fall in the 15% to 23% range.( Clay et al<sup>15</sup>, Fullerton et al<sup>16</sup>, Frank et al<sup>17</sup>). In contrast, epidemiologic studies show the point prevalence of MDD in primary care settings is slightly lower, between 4.8% and 8.6%.<sup>32</sup> The rate of depression was also consistent with previously reported rates of probable major depression in nonelected community samples of persons with SCI (Bombardier et al<sup>8</sup>, Craig et al<sup>18</sup>) and was more than 3 times greater than the 1-year prevalence of MDD in the general population (6.7%)( Kessler et al) The original validity study showed that PHQ-9 diagnosed MDD had a sensitivity of 73% and a specificity of 98% and the PHQ was not found to have a systematic tendency to over diagnose or under diagnose MDD ( Spitzer et al<sup>37</sup>). Probable MDD was not related to SCI-related variables such as Level of injury, or Age of patient was also proved in this study.

Somatic symptoms including psychomotor disturbance, appetite change, and sleep disturbance have been found to be uniquely associated with MDD after SCI. (Clay et al<sup>15</sup>)

This study confirms the previous research by (Clay et al<sup>15</sup>) that suggests somatic symptoms of depression such as appetite change, sleep disturbance, and poor energy are sensitive and specific to people with probable MDD. Another indicator of the serious nature of depression in the people with SCI is our finding that 40 % of participants endorsed current suicidal ideation compared with only 9% in primary medical care patients.( Goodwin et at )These findings suggest that regular screening of depression among SCI-patients may assist in the early detection and treatment. As compare with another prevalence studies of depression after SCI,(Dryden et al<sup>21</sup>, Reed<sup>22</sup>, Banergea et al<sup>23</sup>) they provided depression diagnosis using diagnostic measure of depression only. In this study depression was measured, including the depression symptom severity for individual SCI patients. In a study of Bombardier CH et al. ( 2004 )<sup>10</sup> in which the average PHQ – 9 total score for the entire sample was 5.48 ( 95 % confidence interval 5.07 – 5.88 ). 11.4 % people met criteria for probable MDD, with a Mean PHQ – 9 score of 18.1 ± 3.9 ,whereas the Non depressed patient had an overall Mean score of 3.8 ± 3.9. As compare with this study, in my study the average PHQ – 9 total score for the entire sample was 9.00 ( 95 % confidence interval 6.49 – 11.51). 10 (40 %) people met criteria for probable MDD, with a Mean PHQ – 9 score of 15.30 ± 3.74, whereas the non depressed patients had an overall Mean score of 4.80 ± 2.65. As compare within the average PHQ – 9 scores of these two studies, in my study PHQ -9 score of entire sample is more, and 40 % people met criteria for probable MDD which is also more.

This study highlights the high prevalence ( 40 % ) of depression after SCI. In studies that used DSM-IV criteria for depression diagnosis, depression prevalence estimates were

higher than in those that used criteria from DSM-III or RDC (the DSM-III predecessor). As the DSM is revised, one intention is that its diagnostic sensitivity and specificity are also improved, which may partially explain this finding. This relation should be further studied as studies of depression after SCI using Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, and criteria emerge. (Williams & Murray )<sup>24</sup>By interpreting the degree to which depression is experienced by individual SCI patients may assist in

normalizing the diagnosis for individuals who experienced traumatic SCI and further underscore the importance of research in measuring depression. Clinically improving the accuracy rates of prevalence of depression following spinal cord injury can be used to improve screening and treatment efforts for better outcomes.

#### 4. Results

**Table 1:** Table showing Mean & Standard Deviation of Variable Age, Time since injury and PHQ – 9 for total no. of subjects ( N= 25 )

	N	Minimum	Maximum	Mean	Std. Deviation	Std. Error Mean
Age	25	18	68	35.16	13.117	2.623
Time Since Injury	25	5	168	34.08	33.565	6.713
PHQ-9 Score	25	0	23	9.00	6.076	1.215
Valid N (list wise)	25					

Table 1 shows T – test : One – Sample statistics is done for total no.of subjects (N= 25) to calculate the Mean ± Standard Deviation of variable Age, Time Since Injury & PHQ – 9 Score.

Results were found that the Mean ± Standard Deviation of variable Age is 35.16 ± 13.117 years. Mean ± Standard Deviation of variable Time Since Injury is 34.08 + 33.565 months. Mean ± Standard Deviation of variable PHQ – 9 Score is 9.00 ± 6.076.

**Table 2 :** One-Sample Test - Table showing t-test value of variable Age ,Time since injury & PHQ – 9 Score for total number of subjects ( N = 25 ) at 95 % confidence interval of the difference.

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Age	13.402	24	.000	35.160	29.75	40.57
Time Since Injury	5.077	24	.000	34.080	20.23	47.93
PHQ-9 Score	7.406	24	.000	9.000	6.49	11.51

Table 2 shows One – Sample test for total no.of subjects (N = 25) to calculate the results for variable Age ,Time since injury & PHQ – 9 Score upto 95 % confidence interval of the difference. Table shows the result that t value of variable Age at 95 % confidence interval of the difference is 13.402 years ( 95 % CI 29.75 – 40.57 ) , t value of variable Time since injury at 95 % confidence interval of the difference is 5.077 months ( 95 % CI 20.23 – 47.93 ) , t value of variable PHQ – 9 Score at 95 % confidence interval of the difference is 7.406 ( 95 % CI 6.49 – 11.51 ) .

injury, Pair 2 between variable Age & PHQ – 9 score, Pair 3 between Variable Time since injury & PHQ – 9 score for total no.of subjects ( N= 25 )

		N	Correlation	Sig.
Pair 1	Age & Time Since Injury	25	.043	.839
Pair 2	Age & PHQ-9 Score	25	.131	.532
Pair 3	Time Since Injury & PHQ-9 Score	25	.351	.085

Table 3 shows Paired Samples Correlations test for total no.of subjects N= 25. The Paired Samples Correlations test concluded that results are Non-Significant

**Table 3 :** Paired Samples Correlations – Table showing Correlation for Pair 1 between variable Age & Time since

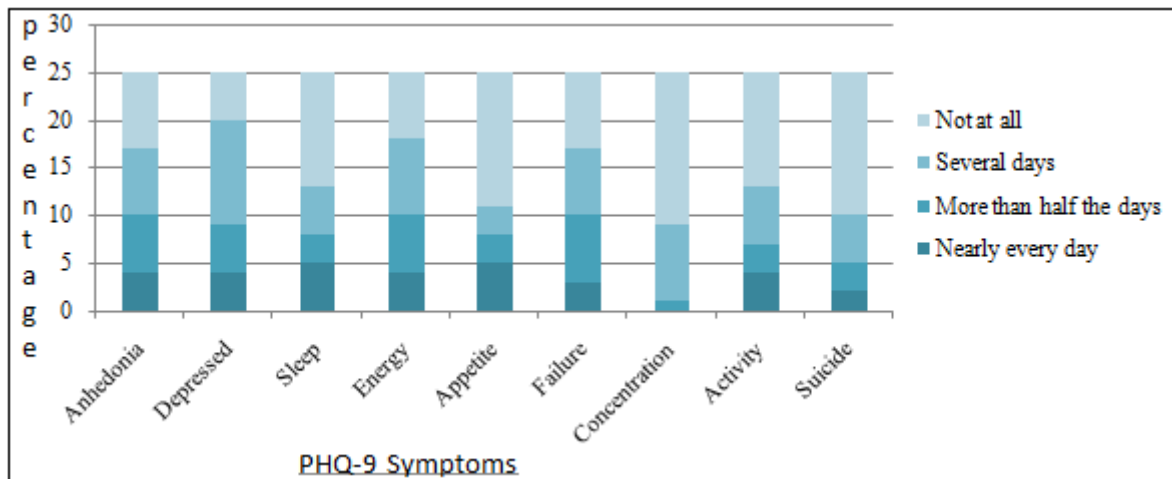
**Table 4:** Paired Samples Test – Table showing Correlation for Pair 1 between variable Age & Time since injury, Pair 2 between variable Age & PHQ – 9 score, Pair 3 between Variable Time since injury & PHQ – 9 score for total no. of subjects ( N= 25 )

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Age - Time Since Injury	1.080	35.508	7.102	-13.577	15.737	.152	24	.880
Pair 2	Age - PHQ-9 Score	26.160	13.713	2.743	20.499	31.821	9.538	24	.000
Pair 3	Time Since Injury - PHQ-9 Score	25.080	36.149	7.230	10.158	40.002	3.469	24	.002

Table 4 shows Paired Samples test – 2 tailed T test for total no.of subjects (N= 25) . In this Paired Samples test result is Significant.

**Table 5:** Rates of depression symptom severity according to PHQ – 9 Questionnaire ( N = 25 )

Label	Definition	Rate , n ( % )
No depressive symptoms	PHQ – 9 = 0	1 ( 4 )
Minimal depressive symptoms	PHQ – 9 = 1 to 4	7 ( 28 )
Mild depressive symptoms	PHQ – 9 = 5 to 9	7 ( 28 )
Moderate depressive symptoms	PHQ – 9 = 10 to 14	4 ( 16 )
Moderate/Severedepressive symptoms	PHQ – 9 = 15 to 19	5 ( 20 )
Severe depressive symptoms	PHQ – 9 = 20 to 27	1 ( 4 )
Probable MDD	Reports at least 5/9 symptoms (must include either depressed mood or anhedonia)	10 ( 40 )



**Figure 1:** Reports of PHQ – 9 depression symptoms for the entire sample ( N = 25 )

In this study, sample comprised of 25 participants with traumatic SCI who provides complete data on Patient Health Questionnaire – 9 score at 1 month post injury. Sample characteristics were 19 male (76 %) & 6 female (24 %). Mean ± standard deviation of variable Age of SCI patients was 35.16 ± 13.117 years. Etiology of SCI was vehicular accident 68 %, Fall 28 %, violence 4 %. Nearly more than half 20 patients (80%) had ASIA grade A “ Complete injuries ” & 5 patients (20%) had ASIA grade B – E “ Incomplete injuries ”. 84 % had Paraplegia & 16 % had Tetraplegia.

## 5. Conclusion

This study highlights the high prevalence of depressive disorders after SCI. MDD is a prevalent, disabling and undertreated condition associated with Spinal cord injury.

The use of valid and reliable depression screening tools is an important first step toward improved recognition and treatment for depression. This study presented that the PHQ – 9 is a reliable and valid screener of MDD in people with SCI who are 1 month post injury and suggest that PHQ – 9 can be used more widely in SCI care settings to identify those in need of further evaluation and potential treatment for depression in rehabilitation.

This study supports a shorter and more streamlined approach to screening for depression after SCI. A 9-item self-report measure may be able to diagnose MDD with sufficient accuracy to reduce the need for a separate diagnostic interview.

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