

# The Impact of Depression on Quality of Life and Depression Related Factors in Patients with Spinal Cord Injury

## Spinal Kord Yaralanmalı Hastalarda Depresyonla İlişkili Faktörler ve Depresyonun Yaşam Kalitesine Etkisi

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Geliş Tarihi/Received: 17.01.2018  
Kabul Tarihi/Accepted: 01.06.2018

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*This study was reported as verbal notice with the title of "The Impact of Depression on Quality of Life and Depression Related Factors in Patients with Spinal Cord Injury" in the 26. National Physical Medicine and Rehabilitation Congress, 25-29 April 2017, Antalya, Turkey.*

**ABSTRACT Objective:** The aim of this study was to examine the relationship between depression and demographic and clinical characteristics of the patients, and the effects of depression on quality of life (QoL) in patients within the first six months after spinal cord injury (SCI). **Material and Methods:** One hundred patients with traumatic SCI who underwent inpatient rehabilitation program were enrolled in the study. Demographic data, etiology of injury and duration of disease (days) were recorded for all patients. Neurological level (cervical, thoracic, lumbosacral) and lesion severity (complete, incomplete) were determined according to the American Spinal Injury Association Impairment Scale (AIS). The Functional Independence Measure was used to assess functionality, the 36-Item Short-Form Health Survey was used to evaluate QoL, and the Beck Depression Inventory was used to assess depression. **Results:** There was a relationship between depression and female gender, lower education level, type of caregiver, the presence of pain and sleep disturbances. No relation was found between depression and injury severity, level of injury, or extent of functional impairment. BDI scores were negatively correlated with most of the components of SF-36 quality of life scale. There was a statistically significant difference in SF 36-Mental Component Scores between the groups according to the depression severity. Cared by a foreign caretaker, having a sleep disturbance and pain were found to be associated independent risk factors with the presence of clinically significant depression. **Conclusion:** The results of this study demonstrate that gender, education level, type of caregiver, presence of pain and sleep disturbances are the major determinants of depression in patients within the first six months after SCI. Findings showed the importance of family support to care for patients in SCI rehabilitation. It is important to treat pain, sleep disturbance and depression together in an early period of rehabilitation to improve QoL.

**Keywords:** Spinal cord injury; depression; quality of life

**ÖZET Amaç:** Bu çalışmada spinal kord yaralanmalı hastalarda travmadan sonraki ilk altı ay içinde depresyonun demografik ve klinik özellikler ile ilişkisi ve depresyonun yaşam kalitesine etkisi araştırıldı. **Gereç ve Yöntemler:** Travmatik spinal kord yaralanmalı yatarak rehabilitasyon programı alan 100 hasta çalışmaya dahil edildi. Hastaların demografik özellikleri, yaralanma etyolojisi ve yaralanma sonrası geçen süre kaydedildi. Yaralanma seviyesi ve şiddeti Amerikan Omurilik Derneği (ASIA) bozukluk ölçeği ile, fonksiyonel durum Fonksiyonel Bağımsızlık Ölçütü (FIM) ile, yaşam kalitesi kısa form 36 ile, depresyon Beck Depresyon Ölçeği (BDÖ) ile değerlendirildi. **Bulgular:** Çalışmamızda depresyon ile kadın cinsiyet, düşük eğitim seviyesi, hasta bakıcısı tipi, ağrı ve uyku bozukluğu varlığı arasında anlamlı ilişki tesbit edildi. Depresyon ile yaralanma seviyesi, şiddeti ve fonksiyonel yetersizlik arasında ilişki saptanmadı. BDÖ skorları SF-36 yaşam kalitesi ölçeğinin bir çok alt parametresi ile negatif korele idi. Depresyon şiddetine göre yapılan gruplarda SF-36 mental alt parametre skorları açısından gruplar arası istatistiksel olarak anlamlı fark izlendi. Yabancı bakıcı ile bakım, uyku bozukluğu ve ağrı olması klinik olarak anlamlı depresyon varlığı ile ilişkili bağımsız risk faktörü olarak bulundu. **Sonuç:** Bu çalışmada cinsiyet, eğitim seviyesi, hasta bakıcısı tipi, ağrı ve uyku bozukluğu varlığının spinal kord yaralanmalı hastalarda ilk altı ayda depresyonun en önemli belirteçleri olduğu görüldü. Bulgular hasta bakımında aile desteğinin önemini gösterdi. Ağrı, uyku bozukluğu ve depresyonu beraber tedavi etmek erken dönem rehabilitasyonda yaşam kalitesini arttırmak için önemlidir.

**Anahtar Kelimeler:** Spinal kord yaralanması; depresyon; yaşam kalitesi

Depression is the primary psychological problem among patients with spinal cord injury (SCI) and affects the quality of life.<sup>1</sup> The prevalence of depression after SCI is substantially greater than in the general medical population and has been reported as 30% of persons during inpatient hospitalization.<sup>2,3</sup> Depressive symptoms are associated with increased stays in hospital, fewer functional improvements in SCI rehabilitation, and increased mortality and morbidity.<sup>4,5</sup> Untreated depression is an important risk factor in the reduced quality of life (QoL), and a better QoL is the ultimate goal of rehabilitation.<sup>6,7</sup> There are many articles about factors associated with depression in individuals with SCI. Most of the previous studies comprised patients who were investigated one year after the injury. A few studies investigated the psychological disorders within the one year duration.<sup>7</sup> A number of demographic characteristics have been identified as potential predictive factors for depression.<sup>8</sup> Predictive factors for depression should be determined to prevent and treat depression in individuals with SCI. Our objectives were to examine first the relationship between depression and demographic and clinical characteristics of the patients and second the effects of depression on QoL in patients within the first six months after SCI.

## MATERIAL AND METHODS

One hundred patients with traumatic SCI who underwent inpatient rehabilitation treatment at Ankara Physical Medicine and Rehabilitation Training and Research Hospital were enrolled into the study. Subjects included in the study were older than 16 years, able to speak and understand the tests, and had SCI within the first six months of injury. Patients with concomitant traumatic brain injury and impaired mental functions were excluded from the study. The study was approved by the local institutional ethical committee, and written consent was taken from each patient. Demographic data, etiology of injury, duration of disease (days), the presence of pain and sleep disturbance were recorded for all patients. Neurological level (cervical, thoracic, lum-

bosacral) and lesion severity (complete, incomplete) were determined according to the American Spinal Injury Association Impairment Scale (AIS). A quantitative analysis was not used to evaluate the presence of pain and sleep disturbance. The occurrence of pain and sleep disturbance was registered as follows: 0=no complaint 1=presence complaint. Type of caregiver of patients were divided into two groups; a member of the family and a foreign caretaker.

Functional outcomes, QoL, and depressive symptoms were assessed using the Turkish version of the Functional Independence Measurement (FIM), 36-Item Short-Form Health Survey quality of life scale (SF-36 QoLS), and Beck Depression Inventory (BDI), respectively.<sup>9-11</sup> FIM consists of 6 subtests (self-care, sphincter control, transfer, locomotion, communication, and social cognitive ability) with a maximum total score of 126. The SF-36 QoLS is a multi-purpose, short-form health survey containing 36 questions. It yields an eight-scale profile of physical function (PF; 10 items), physical role dysfunction (PRD; 4 items), role of mental status (RMS; 3 items), mental health (MH; 5 items), vitality/energy (V/E; 4 items), pain (2 items), general health (GH; 5 items), and social function (SF; 2 items). 13 subscales award health points of 0 to 100, with 100 indicating the best state of health. Each subscale score can give a separate result. Calculation of the total scores of the scale was not feasible. In this study, the scores of eight components and the total physical health component scores and total MH component scores were used.<sup>12</sup> BDI is a 21-item, self-reporting inventory that measures characteristic attitudes and symptoms of depression. Higher total scores indicate more severe depressive symptoms.<sup>13</sup> Scores on individual items range from 0 to 3, with total scores ranging from 0 to 63. Beck and colleagues have suggested the following cut-off scores and interpretive labels to characterize scores on the BDI-II: minimal (0-13), mild (14-19), moderate (20-28), and severe (29-63) depression. They also recommended that a cutpoint of 17 or greater be used to identify research samples with clinically significant depressive symptomatology.<sup>14</sup>

## STATISTICAL ANALYSIS

Analysis of the data was performed using SPSS package program (version 20.0, SPSS Inc., Chicago, IL, USA). Normal distribution of continuous variables was assessed by Shapiro-Wilk test. The descriptive statistics were presented as mean±standard deviation for continuous variables and median (minimum-maximum) for discrete variables. Categorical variables were expressed as the number of cases (n) and percentage (%). The significance of the difference in terms of mean values was analyzed by Student t test between two independent groups, and by one-way ANOVA between three or more groups. Pearson's correlation analysis was used to assess the association between numerical variables. A  $p < 0.05$  was considered statistically significant.

A backward stepwise logistic regression model was used to evaluate independent predictors associated with depression development (dependent variable) in SCI. Variables which were found to be significantly different between the groups (patients with BDI score  $< 17$  and  $\geq 17$ ) were included as candidate risk factors to the model. Variables with  $p$ -values less than 0.10 in univariate analysis were incorporated into the multivariable model. Effects of the factors on the depressive symptoms were expressed as odds ratio (OR) with 95% confidence interval (CI).

## RESULTS

Demographic and clinical characteristics of the patients are shown in Table 1.

The relationships between BDI scores and demographic and clinical characteristics are demonstrated in Table 2. The mean BDI score in women was significantly higher than men with SCI ( $p=0.02$ ). The mean BDI score in the illiterate group was significantly higher than other education groups ( $p=0.03$ ). Patients who were cared by a caretaker had significantly higher mean BDI scores than those who were cared by a member of the family ( $p=0.003$ ). We found no significant relationship between depression and marital status and occupation at the time of injury. Patients with pain

Age (years), mean ±SD	38.86±16.55
Body mass index (kg/m <sup>2</sup> ), mean ±SD	25.23±5.08
Gender, n (%)	
Male	70 (70)
Female	30 (30)
Marital status, n (%)	
Single	37 (37)
Married	59 (59)
Widowed	4 (4)
Education level, n (%)	
Illiterate	12 (12)
Primary school	47 (47)
High school-university	41 (41)
Occupation at time of injury, n (%)	
Working (worker, officer)	51 (51)
Housewife	22 (22)
Retired	10 (10)
Student	17 (17)
Level of injury, n (%)	
Cervical (C1-C8)	30 (30)
Thoracic (T1-T12)	52 (52)
Lumbar (L1-S4/5)	18 (18)
Completeness of injury, n (%)	
Complete (ASIA A)	57 (57)
Incomplete (ASIA B-E)	43 (43)
Ambulatory status, n (%)	
Non-ambulatory	76 (76)
Ambulatory	24 (24)
Duration since injury (days), mean±SD	93.32±40.49
BDI, mean±SD	16.9±9.32
FIM, mean±SD	78.95±16.21

BDI: Beck depression inventory; FIM: Functional independence measurement.

and sleep disturbances had significantly higher mean BDI scores than those without pain and sleep disturbances ( $p= 0.04$  and  $p<0.001$ ). Besides, we found no significant relationship between depression and injury characteristics. The correlation analysis between BDI scores and age ( $r=0.155$   $p=0.12$ ); and duration of injury ( $r=0.115$   $p=0.20$ ) also performed but the results were not statistically significant.

A multivariate logistic regression analysis was performed to detect possible associated factors with the presence of clinically significant depression. Only cared by a caretaker, having

**TABLE 2:** The relationship between BDI score and demographic and clinical characteristics.

				BDI score (mean±SD)	p
Gender, n (%)	Male	70	70	15.55±9.29	0.02
	Female	30	30	20.03±8.7	
Education, n (%)	Illiterate	12	12	23.25±10.10	0.03
	Primary school	47	47	15.40±7.77	
	High school-university	41	41	16.75±10.14	
Occupation at the time of injury, n (%)	Working	51	51	14.92±9.56	0.09
	Housewife	22	22	19.50±9.10	
	Retired	10	10	21.50±8.12	
	Student	17	17	16.76± 8.45	
Marital status, n (%)	Single	37	37	16.24±8.82	0.64
	Married	59	59	17.52±9.77	
	Widowed	4	4	13.75±7.80	
Caregiver, n (%)	A member of family	87	87	16.14±8.86	0.003
	A foreign caretaker	13	13	24.81±9.29	
Pain, n (%)	No	18	18	13.11± 6.39	0.04
	Yes	82	82	17.73±9.68	
Sleep disturbances, n (%)	No	44	44	13.20± 8.49	<0.001
	Yes	56	56	19.80±8.98	
Level of injury, n (%)	Cervikal	30	30	19.13±8.33	0.24
	Thoracic	52	52	16.36±9.4	
	Lumbar	18	18	14.72±10.39	
Completeness of injury, n (%)	Complete	57	57	16.94±8.64	0.95
	Incomplete	43	43	16.83±10.26	
Ambulatory status, n (%)	Non-ambulatory	76	76	17.22±8.26	0.61
	Ambulatory	24	24	15.87±12.26	

a sleep disturbance and pain were found to be associated independent risk factors after adjustment for confounding variables (Table 3).

Correlations of BDI scores with FIM and SF-36 scores are shown in Table 4. There was no correlation between BDI scores and FIM. BDI scores were negatively correlated with most of the SF-36 components. ( $r=0.129$   $p=0.04$  for bodily pain,  $r=-0.56$   $p<0.001$  for general health,  $r=-0.651$   $p<0.001$  for vitality,  $r=-0.585$   $p<0.001$  for social functioning,  $r=-0.207$   $p=0.03$  for role emotional,  $r=-0.663$   $p<0.001$  for mental health) .

Table 5 shows the relationship between depression severity and QoL. When we divided the patients into groups according to the depression severity, there was a significant difference in SF 36-MCS between the groups.

**TABLE 3:** Multivariate logistic regression model of factors related to the presence of clinically significant depression in spinal cord injury.

Variables	OR	95% CI	P
Age	1.043	0.979-1.112	0.18
Female gender	1.112	0.898-2.101	0.09
Pain	1.102	1.076-2.601	0.04
Education	2.283	0.323-2.226	0.23
Caregiver	1.161	0.129-1.894	0.02
Sleep disturbance	1.201	1.066-1.143	0.01

CI: Confidence Interval; Significance at  $P<0.05$ .

## DISCUSSION

The present study had two aims. The first aim was to examine which demographic and clinical characteristics were associated with depression in patients within the first six months after SCI. The

**TABLE 4:** Correlations of BDI scores with FIM and SF-36.

	(r)	p
FIM	-0,05	0,56
SF-36		
Physical functioning	-0,135	0,17
Role-physical	-0,153	0,12
Bodily pain	-0,129	0,04
General health	-0,56	<0,001
Vitality	-0,651	<0,001
Social functioning	-0,585	<0,001
Role-emotional	-0,207	0,03
Mental health	-0,663	<0,001
PCS	-0,099	0,32
MCS	-0,598	<0,001

MCS: Mental component scores; PCS:Physical component scores.

second aim of our study was to assess the effects of depression on QoL in patients within the first six months after SCI. We suggest that the identification and treatment of depression during the early period of SCI rehabilitation should be a priority. The results of our study showed that there were relationships between depression and female gender, lower education level, type of caregiver, the presence of pain and sleep disturbances. No relations were found between depression and injury severity, level of injury, or extent of functional impairment. These findings demonstrate that gender, education level, type of caregiver, the presence of pain and sleep disturbances were the major determinants of depression in patients within the first six months after SCI.

Consistent with previous studies, we showed that the mean BDI score was significantly higher in women than in men.<sup>15,16</sup> But our finding was inconsistent with Fann et al.'s study.<sup>17</sup> They suggested that men with SCI were significantly more

depressed than women with SCI. Yet other studies found no significant differences between men and women.<sup>18,19</sup> Our results may be attributed to the differences in social support, cultural or gender differences in expression of feelings.

We found that there is a negative association between education level and depression. Previously lower education level was identified as a potential predictive factor for depression after SCI.<sup>20</sup> In addition, level of education was found to be the strongest predictor of employment after SCI.<sup>21,22</sup> Patients who had a higher level of education were more likely to have a job and be financially self-supporting.<sup>15</sup>

According to our findings, patients who were cared by a member of the family were less likely to have depression than those who were cared by a caretaker. Families have an important role in supporting the mental, emotional, and physical well-being of persons with SCI.<sup>23</sup> We suggest that a member of the family is able to provide more emotional support than another caretaker.

Pain is a significant problem for patients with SCI.<sup>24</sup> Patients with SCI have described the pain as the most difficult medical condition to deal with, more so than the loss of motor or sensory function.<sup>25</sup> Pain and depression are closely related and there is increasing evidence that depression often coexists with pain.<sup>26</sup> The relation among pain and depression has been examined in SCI and evidence on the relation between pain and depression has been documented.<sup>27</sup> SCI patients with pain may view their disability more negatively because of the additional negative impact of pain on their lives.<sup>28</sup> Like pain, sleep problems occur frequently in patients with SCI.<sup>29</sup> Patients with SCI may have more

**TABLE 5:** The relationship between depression severity and QoL.

	Minimal depression (n=40)	Mild Depression (n=26)	Moderate Depression (n= 20)	Severe Depression (n=14)	p
BDI scores	8.07±3.77	16.7±1.95	23.8±3.03	32.5±4.65	
SF 36-PCS	29.78±7.98	25.78±6.62	26.86±4.95	29.23±7.094	0.12
SF 36-MCS	52.15±8.05	50.59±11.06	39.88±8.84	29.47±8.53	<0.001

BDI scores: 0-13 minimal depression; 14-19: mild depression; 20-28: Moderate depression; 29-63: Severe depression; MCS: Mental component scores; PCS:Physical component scores.

sleeping problems due to pain.<sup>28</sup> Our results supported the relationship between depression and both pain and sleep disturbances. Therefore, this association suggests that emotional distress experienced by these patients is significantly influenced by the presence of pain and sleep disturbance. Early assessment and treatment of sleep disturbance and pain may be an important strategy for prevention and intervention of depression in patients with SCI.

No significant relationship could be found between injury severity and depression, which contradicts with some of the previous studies showing the negative effect of injury severity on depression.<sup>15</sup> In addition, we found no relationship between completeness of injury and depression. But our finding was inconsistent with the result of Shin et al. that motor incomplete SCI patients were less depressed.<sup>7</sup> They suggest that the capability to move a part of the body can make people less depressive. There was no difference in BDI scores in terms of ambulation ability and no correlation between FIM and depression. In our study, patients were under functional training in early period of rehabilitation and we suggest that they expect to recover their motor functions in the future. According to these results, level and completeness of injury and functional impairment were not determinants of depression within the first six months after SCI.

The second aim of our study was to assess the effects of depression on QoL in patients within the first six months after SCI. BDI scores were negatively correlated with most of the SF-36 components (bodily pain, general health, vitality, social functioning, role-emotional, mental health). Only physical functioning and role physical scores were not correlated with BDI scores. When we divided the patients into groups according to the depression severity, there was a significant difference in

the quality of life between the depression groups. These results demonstrated that depression was associated with lower QoL in patients with SCI during the first 6 months. QoL is a key outcome measure following the SCI.<sup>30</sup> Given the negative impact of depression in patients with SCI, early identification and treatment are important to increase the QoL. Our findings highlighted the importance of evaluating depression in early period of rehabilitation.

The first limitation is that we did not compare results between patients who were injured within the last six months and with those injured during the period more than six months. The second limitation is that some factors influencing depression such as symptoms of emotional distress before SCI, duration of hospital stay and income were not detected. Persons displaying clinically symptoms of emotional distress before SCI may be at more risk for depression after SCI. Financial difficulties may affect persons with SCI. Individuals with SCI who earned income by themselves had a lower frequency of depression than those who were provided financial support from others.<sup>15</sup> Hospital environment may be a contributing factor in depression. More detailed assessment is required for socioeconomic, demographic and comorbidity variables.

To our best notice, this is the first study displaying depression associated factors and the effect of depression on QoL in patients within the first six months after SCI in our country. We suggest that depression is related to gender, education level, type of caregiver, the presence of pain and sleep disturbance. Findings showed the importance of family support to care for patients in SCI rehabilitation. It is important to treat pain, sleep disturbance and depression together in early period of rehabilitation to improve QoL.

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