Poststroke depressive symptoms and their relationship with quality of life, functional status, and severity of stroke

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ABSTRACT

الأهداف: للتحقق من العلاقة بين الأعراض الإكتئابية خلال ستة أشهر بعد التعرض للجلطة الدماغية، وجودة الحياة (QOL)، والخصائص السريرية، الاجتماعية، السكانية، الحالة الوظيفية، وشدة الجلطة.

الطريقة: تم تقييم حالة 90 مريضاً تعرض لجلطة دماغية والذين يتم متابعة حالتهم في العيادات الخارجية بمستشفى إريسياس الجامعي بتركيا، خلال الفترة ما بين مارس 2004م وحتى مارس 2005م. شملت الدراسة 70 مريضا من العيادات الخارجية والذين قد تعرضوا لجلطة دماغية قبل ستة أشهر. كأداة جمع للبيانات، تم استعمال النموذج القصير 36 (SF–36)، وقياس الاستقلالية الوظيفي (FIM)، وومقياس النقاط العصبي الكندي (CNS)، وقائمة بيك لجرد الإكتئاب (BDI)، بالإضافة إلى إجراء الاستبيانات من أجل الحصول على البيانات السريرية والاجتماعية السكانية.

النتائج: شملت الدراسة سبعين مريضاً، تم تحديد قياس الإكتئاب باستعمال (BDI) بنسبة 47.1% من المرضى. انخفضت نقاط (FIM) الكاملة خاصة نقاط الجهاز الحركي لدى المرضى المصابين بالإكتئاب. لم يتبين وجود فرقا في نقاط شدة الجلطة للمرضى المصابين بالإكتئاب والمرضى غير المصابين به. كانت نقاط جودة الحياة (QOL) مثل: الوظيفة البدنية، والألم الجسدي، والإدراك الصحي العام، والحيوية، والوظيفة الاجتماعية، والصحة العقلية أقل لدى مجموعة المرضى الذين لديهم نقاط عالية من (BDI). كانت هنالك صلة إيجابية بين العمر ونقاط (BDI) لدى المرضى. تبين وجود صلة سالبة بين نقاط (QOL) و (FIM) في النقاط الكاملة ونقاط الجهاز الحركي.

خاتمة: يبدو أن الإكتئاب بعد الإصابة بالجلطة الدماغية مرتبط بالعمر، ومستوى التعليم، وجودة الحياة (QOL)، والحالة الوظيفية.

Objectives: The present study aimed to investigate the relationship between depressive symptoms in 6 months after stroke and the quality of life (QOL), clinical and socio-demographical characteristics, functional status, and severity of stroke.

Methods: Ninety consecutive stroke patients who attended the neurology outpatient clinic at Erciyes University, Kayseri, Turkey from March 2004 to March 2005 were evaluated for the study. Seventy outpatients who had a stroke 6 months previously were included in the study. As a data-collecting device, Short Form 36, Functional Independence Measure (FIM), Canadian Neurological Scale, and Beck Depression Inventory (BDI) were used. In addition, a questionnaire was administered to obtain clinical and socio-demographic data.

Results: Seventy patients were included in the study. Depression measured using BDI was identified in 47.1% of the patients. Total FIM scores, especially motor subscale scores, were decreased in the depressive patients. No difference was found in the stroke severity scores of the depressed and non-depressed patients. The QOL subscale scores, such as physical functioning, bodily pain, general health perception, vitality, social functioning, and mental health, were lower in the patient group with high BDI scores. There was a positive correlation between age and BDI scores of the patients. Negative correlations were found between the scores of QOL and FIM in both total and motor subscale scores.

Conclusion: Poststroke depression seems to be associated with age, education level, QOL, and functional status.

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Stroke is a major public health problem in many countries.[1,2] Stroke is one of the most common causes of death, and disability in many countries.[3] It has been reported that stroke results in partial or complete disability between 24% and 54% of patients with stroke in the first year.[2] Stroke has a substantial impact on the psychological and physical well-being of both patients and their families.[1] Depression is probably the most common and serious emotional disorder following stroke.[4,5] The reported prevalence of post-stroke depression (PSD) varies from 20-65%.[6,7] Depression may result directly from a distorted body image, stroke-induced handicap or, especially disruption of daily habits and work.[8] Depression may also be a neurochemical complication of the lesion.[9] Therefore, the determination of its causes and its treatment are difficult. Many studies have investigated the association between poststroke depression and stroke severity,[10] functional impairment,[11] quality of life (QOL),[6,12] lesion location,[13] and some socio-demographical factors.[14] However, inconsistent findings regarding factors associated with PSD have been reported. A possible explanation for this discrepancy may be the different methodology of the studies. Studies investigating all probable related factors - stroke severity, functional status, lesion type and localization, QOL, and socio-demographical factors, are limited in the literature. The present study aimed to investigate the relationship between depressive symptoms 6 months after stroke and the QOL, clinical and socio-demographical features, functional status, and severity of stroke.

Methods. Ninety consecutive stroke patients attending the Neurology Outpatient Clinic at Erciyes University, Kayseri, Turkey from March 2004 to March 2005 were evaluated for the study. Seventy (77%) patients fulfilled the inclusion criteria and were included in the study. The study group comprised 27 male (38.6%) and 43 female (61.4%) patients. The mean age ± SD was 60.16 ± 11.30 years, and the age range was 23-83 years. All patients were required to visit the Outpatient Clinic at an appointed date. Written informed consent was obtained from all patients after the study was explained. The study was approved by the Local Ethics Committee of Erciyes University School of Medicine. The inclusion criteria were: 1) cerebral infarction or hemorrhage demonstrated by CT or MRI, 2) a stroke 6 or more months previously, and 3) stroke for the first time. Patients with communication problems, psychiatric disorders other than depression, other neuromusculoskeletal disorders, and low score (<24) in the Mini Mental State Examination (MMSE) were excluded. Short form 36 (SF-36). The QOL was measured with the self-administered SF-36 Health Survey. This survey is designed for use in clinical practice and research, health policy evaluations, and general population surveys,[15] and contains 36 items that are scored in 8 subscales: physical functioning (PF), role limitations due to physical health problems (RP), bodily pain (BP), general health perception (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE) and mental health (MH). It also includes a single item that provides an indication of perceived change in health. For each subscale, a score ranging from 0 (worst measured health) to 100 (best measured health) was calculated.[15] Additionally, subscale scores were calculated for physical health (PCS) and mental health (MCS) components of health-related quality of life (HRQOL). A standardized algorithm was used to calculate the scores for the 8 domains and 2 dimensions of the SF-36 and these were transformed to norm-based scores with a mean of 50 and a standard deviation of 10.[16,17] The reliability and the validity for the Turkish population of the scale were carried out by Koçyigit et al.[18]

Canadian neurological scale (CNS). Stroke severity was assessed using the CNS, which was designed to assess neurological function in conscious stroke patients. It includes an assessment of the level of consciousness, orientation, aphasia and motor strength. Each domain is assigned a score, and a total score from 0 to 11.5 is then calculated. The CNS was administered by a physiotherapist.

Functional independence measure (FIM). The FIM was used by the physiotherapist in order to assess the level of functional impairment. The FIM is one of the most widely used disability and dependence assessment instruments in rehabilitation medicine. It is an 18-item, 7 level ordinal scale. A total FIM score generated through totalling subscale scores assessing self-care, sphincter control, mobility, locomotion, communication, and social cognition served as the overall measure of neurological status and functioning. It consists of 13 motor and 5 cognitive items. Each item is scored on a scale from 1 to 7, depending on the person's level of dependency. The maximum score is 126 points. The reliability and validity for the Turkish population of the scale were performed by Küçükdeveci et al.[19]

Beck depression inventory (BDI). Severity of depression was measured with BDI by a psychologist. The reliability and validity of BDI have been tested for the Turkish population by Hisli.[20] Each item on the scale is given 0-3 points. The highest point obtainable is 63. The cut off point of the scale is 17.[21] Patients were subdivided using a cut-off score of 18 into 2 groups, those without depressive symptoms (<18) or with depressive symptoms (>18). Data were expressed as mean ± standard deviation or median with minimum-

maximum values. The chi-square test was used for the comparison of qualitative variables between the patients whose BDI scores were <18 and those with scores >18, for gender, marital status, education, residence, internal illness, lesion localization, and lesion type. To compare continuous variables, parametric and non-parametric analyses were performed after testing the appropriateness of variables to normal distribution. To compare the 2 groups, in the respect to scales scores, student t test was applied. To determine the risk factors that influenced the BDI scores of <18 and those >18, univariate and multiple (The backward Wald procedure) logistic regression analyses (risk factors, gender, age, marital status, education, occupation, residence, lesion lateralization and its type, internal problem, FIM motor and cognitive functional scores, CNS score, and SF-36 QOL scores) were applied. The variables that were significant at the $p<0.05$ level in one-variable analyses were taken into multi-variable analysis model. The Pearson correlation test was used to investigate the correlation between socio-demographic and clinic characteristics and BDI scores. All analyses were performed using SPSS for Windows, version 13.0. $P<0.05$ values were considered significant.

Results. Of the patients, 85.7% were married, 67.1% were primary school graduates or less educated, 40% were retired, 94.3% had health insurance, 67.1% lived in the city, 95.7% lived with other family members, and the salary range was 32-2112 USD (median: 352 USD) (**Table 1**). Fifty-one percent of the patients had comorbid diseases, and the most common comorbid diseases were hypertension (45.7 %) and diabetes mellitus (14.3%). The evaluation of patients' quality of life with SF-36 revealed that general health perception and vitality dimensions were the lowest score fields of quality of life (**Table 2**). Mean depression score of the patients was 16.56±11.32 (mean±SD) according to BDI. Depression measured with BDI was identified in 33 (47.1%) of the patients. The patients who had a score of 18 or more in BDI had a higher mean age than the patients who had low (<18) BDI scores. Risk of being depressive according to BDI score was higher in the low (<5 year) education patient group than in the patients who had more than 5 years education. There was no difference between depressed and non-depressed patients in respect to lesion localization. The FIM scores, especially in motor subscale, were increased in the depressive patients according to BDI scores. There was no difference between depressed and non-depressed patients in stroke severity scores. The QOL subscale scores, except RP and RE, were lower in the high BDI score (>18) patient group (**Table 3**). There was a positive correlation between age and BDI scores of

Table 1 - Distribution of the individuals forming the study group in respect to their socio-demographic characteristics and clinical features.

Variables	n (%)
Gender	
Male	43 (61.4)
Female	27 (38.6)
Age (mean ± SD) (min-max)	60.16±11.30 (23-83)
Marital Status	
Married	60 (85.7)
Divorced-Widowed	10 (14.3)
Education	
Primary school graduates or less	47 (67.1)
Middle school and over	23 (32.9)
Occupation	
Retired	28 (40.0)
Housewife	27 (38.6)
Other*	15 (21.4)
Monthly income (median) (min-max)	352 USD (32-2112 USD)
Health Insurance	
Yes	66 (94.3)
No	4 (5.7)
Residence	
City	47 (67.1)
District and village	23 (32.9)
Lives	
Alone	3 (4.3)
With the other family members	67 (95.7)
Comorbid diseases	
Yes	51 (72.9)
No	19 (27.1)
Side of brain lesion	
Left	34 (48.6)
Right	36 (51. 4)
Lesion type	
Infarct	47 (64.1)
Hemorrhage	23 (32.9)
Duration of illness (day) mean ± SD	197.44 ± 26.22
CNS (5.50-11.5) mean ± SD	10.05 ± 1.60
FIM (58-126) mean ± SD	111.66 ± 17.42
BDI Total (2-23) mean ± SD	16.56 ± 11.32
BDI	
<18	37 (52.9)
≥18	33 (47.1)
Total	**70 (100.0)**

*farmer, self-employed
min- minimum, max- maximum, BDI- beck depression inventory, FIM- functional independence measure, CNS - Canadian neurological scale

Table 2 - Dimension scores of the SF-36 in patients with stroke.

Dimension scores	Mean ± SD
Physical functioning	50.64 ± 34.02
Physical role limitations	54.29 ± 42.56
Pain	65.00 ± 32.74
General health perceptions	39.79 ± 17.14
Vitality	41.00 ± 21.24
Social functioning	68.93 ± 30.67
Emotional role limitations	51.43 ± 40.80
Mental health	50.57 ± 18.76
Physical component summary	40.33 ± 9.07
Mental component summary	40.81 ± 10.78

SF-36 - short form-36

Table 3 - Distribution of stroke patients according to beck depression scores.

Variables	BDI		*P*-value
	≥18 (n=33) (mean±SD)	<18 (n=37) (mean±SD)	
Age	64.8 ± 10.1	56.0 ± 10.7	0.001
Gender (%)			
Male	13 (39.4)	14 (37.8)	0.894
Female	20 (60.6)	23 (62.2)	
Marital status (%)			
Married	27 (81.8)	33 (89.2)	0.379
Divorced-Widowed	6 (18.2)	4 (10.8)	
Education (%)			
Primary school graduates or less	14 (42.4)	7 (18.9)	0.030
Middle school and over	19 (57.6)	30 (81.1)	
Occupation (%)			
Retired	13 (39.4)	14 (37.8)	
House wife	16 (48.5)	12 (32.4)	0.161
Other	4 (12.1)	11 (29.7)	
Residence (%)			
City	21 (63.6)	26 (70.3)	0.161
District and village	12 (36.4)	11 (29.7)	
Comorbid diseases (%)			
Yes	26 (78.8)	25 (67.6)	0.420
No	7 (21.2)	12 (32.4)	
Side of brain lesion			
Left	19 (57.6)	15 (40.5)	0.155
Right	14 (42.4)	22 (59.5)	
Lesion type (%)			
Infarct	14 (42.4)	10 (27.0)	0.175
Hemorrhage	19 (57.6)	27 (73.0)	
Duration of illness	195.6 ± 24.1	198.9 ± 27.9	0.599
FIM motor function	74.8 ± 17.4	82.8 ± 13.8	0.036
FIM cognitive function	33.4 ± 1.2	33.8 ± 1.0	0.131
FIM total	108.2 ± 17.8	116.6 ± 13.8	0.029
CNS	9.9 ± 1.5	10.2 ± 1.7	0.494
Physical functioning	34.2 ± 30.4	65.3 ± 30.5	<0.001
Physical role limitations	50.0 ± 42.8	58.1 ± 42.5	0.430
Pain	61.5 ± 30.0	79.3 ± 26.5	0.011
General health perceptions	32.0 ± 16.2	46.8 ± 14.9	<0.001
Vitality	32.3 ± 17.4	48.8 ± 21.6	0.001
Social functioning	58.0 ± 34.1	78.7 ± 23.7	0.004
Emotional role limitations	43.4 ± 38.6	58.6 ± 41.9	0.122
Mental health	44.1 ± 19.4	56.3 ±16.4	0.006
Physical component summary	35.4 ± 7.34	44.7 ± 8.2	<0.001
Mental component summary	38.5 ± 11.2	42.9 ± 10.1	0.090

BDI - beck depression inventory, FIM - functional independence measure, CNS - Canadian neurological scale

Table 4 - The relation between beck depression inventory, socio-demographic characteristics, SF-36 health status and clinical features in stroke patients (Pearson correlation analysis).

Variables	*r*	*P*-value
Age	0.33	0.005
Duration of illness	-0.02	0.893
FIM motor function	-0.31	0.008
FIM cognitive function	-0.16	0.180
FIM total	-0.31	0.007
CNS	-0.21	0.089
Physical functioning	-0.53	<0.001
Physical role limitations	-0.34	0.004
Pain	-0.37	0.002
General health perceptions	-0.49	<0.001
Vitality	-0.50	<0.001
Social functioning	-0.47	<0.001
Emotional role limitations	-0.50	<0.001
Mental health	-0.41	<0.001
Physical component summary	-0.62	<0.001
Mental component summary	-0.34	0.004

BDI - beck depression inventory, FIM- functional independence measure, CNS - Canadian neurological scale, r - Pearson correlation analysis, SF-36 - short form-36

the patients. Negative correlations were found between scores of all subscales of SF-36 and FIM scores in total and motor subscale (**Table** 4). As a result of applying univariate logistic regression analysis, patients with middle school education or over had 3.1 times less the possibility of BDI scores being of >18 than those who had elementary school education. As GH, MH, VT, and SF scores increased, the possibility of BDI scores being >18 decreased. As a result of applying multiple logistic regression analyses, the possibility of BDI scores being >18 increased as age increased. As PF and BP scores increased, the possibility of BDI scores being >18 decreased (**Table** 5).

Discussion. In the present study, approximately half the patients were depressive according to the BDI. In previous studies, the prevalence of PSD that has been reported varies widely from 18-78%, due to the different methods and timing of assessment. Rates of depressive symptoms in the present study are similar to some other studies.[22-24] The formation of depression has multifactorial etiology. Psychological ruin caused by functional incompetence, together with the neurochemical permutation formed by cerebral lesion, are leading factors in causing depression.[24] According to the present study, the mean age of patients was higher in patients with high BDI scores (>18). This result is consistent with most previous studies that report that PSD increases in older patients.[25-27] Some studies could not find an association between age and PSD.[23,28]

Table 5 - The assessment of factors influencing beck depression scale score below 18 and over 18, with logistic regression analysis (Backward-wald elimination method).

Variables	Univariate logistic regression		Multiple logistic regression (backward-wald method)	
	Odd ratio	95% CI	Odds ratio	95% CI
Gender				
Female	1	-	-	-
Male	0.94	0.36-2.46		
Age	1.09	1.03-1.15	1.09	1.02-1.17
Marital Status				
Married	1	-	-	-
Divorced-widowed	1.83	0.47-7.17		
Education				
Primary school graduates or less	1	-	-	-
Middle school and over	0.32	0.11-0.96		
Occupation				
Retired	1	-	-	-
House wife	0.71	0.38-1.34		
Others				
Residence				
City	1	-	-	-
District and village	1.35	0.50-3.67		
Side of brain lesion				
Left	1	-	-	-
Right	0.50	0.19-1.30		
Lesion type				
Infarct	1	-	-	-
Hemorrhage	0.50	0.19-1.37		
Comorbid diseases				
Yes	1		-	-
No	0.56	0.19-1.66		
FIM motor function score	0.97	0.94-0.99	-	-
FIM cognitive function score	0.701	0.44-1.12		
CNS score	0.90	0.67-1.21	-	-
Physical functioning	0.97	0.95-0.97	0.96	0.95-0.99
Physical role limitations	0.99	0.98-1.01	-	-
Pain	0.98	0.96-0.99	0.97	0.94-0.99
General health perceptions	0.94	0.90-0.97	-	-
Vitality	0.96	0.93-0.99	-	-
Social functioning	0.98	0.96-0.99	-	-
Emotional role limitations	0.99	0.98-1.00	-	-
Mental health	0.96	0.93-0.99	-	-

CI - confidence interval, BDI - beck depression inventory, FIM - functional independence measure, CNS - Canadian neurological scale

Elderly people may be more at risk of depression due to functional and cognitive impairment, residence in an institution, and lack of social support.[27] The risk of being depressive according to BDI score was higher in the low (<5 year) education patient group than in patients who had more than 5 years education. It has been reported that a lower level of education is significantly associated with a risk of developing PSD.[29] Nevertheless, some studies have stated that education is not associated with depression.[30]

This study demonstrated that, in the SF-36 scale, GT and VT aspects of QOL were the most effected fields when patients with stroke were evaluated. The effects in these fields may be due to the disability caused by the stroke. The present study also showed that stroke had a negative effect on the QOL, which is compliant with the findings of similar studies.[2,3,31] It seems that there is a relation between QOL scores and depression. It can be debated whether this is a cause or a result. For example, if physical functions are not normal and pain scores are high, depression risk may increase. However, depression may influence other QOL scores. The findings in the correlation table support this, as does the negative relation between QOL and BDI scores. In addition, the present functional state in stroke depression is another factor that affects QOL.[32,33]

Depression accompanying a physical illness may effect the treatment of the patient and their cooperation with the treatment team, their QOL, prognosis, ongoing physical illness, mortality and morbidity in a negative way. In the present study, physical independence level was low in patients who have >18 BDI score. These low scores were significant especially in motor functions. It is reported in the literature that motor and functional development in depressive patients are much lower than in non-depressive patients.[34,35] A study by Sunnybrook on stroke, following up for a year,[28] and by Parikh et al,[36] following up for 2 years, both report a clear similarity between depression and weak functional development. Although depression is seen as a bad prognosis indication for functional and motor development in patients with stroke, there are other studies showing different results.[37,38] Incompetence in mobility, not being able to use the upper extremities, incontinence and cognitive problems, which are the results of stroke, limit patients' daily activities.

In the present study, no association was found between depression and location or type of lesion. This finding is in accordance with previous studies that have also reported no association between lesion laterality or type of lesion and depression.[39,40] Lyketsos et al[41] stated that stroke lesions, under certain circumstances, cause depression through a direct but unknown pathophysiologic process. These results suggest that stroke per se may not result in emotional problems but that such problems result from a complex interaction between patients' personal traits, social circumstances, living arrangements, functional abilities, stroke induced psychological reactions, and organic background. In the present study, the risk of depression after a stroke was not associated with stroke severity. Jaracz et al[30] reported that stroke impairment assessed with the Scandinavian Stroke Scale and individuals with more severe stroke symptoms were more depressed and more disabled. Although depressive patients showed a trend towards higher severity of stroke, the difference was not statistically significant. This result may be contradictory. There is a motor incompetence in our patients that was measured with FIM motor scale and this is associated with depression. As our patients got 24 and more scores in terms of cognitive functions assessed through MMSE, CNS caused them to get conscience, orientation, and high scores in aphase sections and it influenced the total score of CNS. Another finding supporting this is that there was no relationship in cognitive FIM with depression.

The limitation of the present study is that the presence and severity of depressive symptoms were assessed with BDI only. The presence of depression would have been discussed in more detail if depression could have been diagnosed based on DSM-IV criteria. The results obtained from this study show that approximately half the patients were depressive according to BDI, low level of education, and high age were significantly associated with a risk of developing post stroke depression, stroke severity, location of lesion or lesion type do not affect poststroke depressive symptoms, depressive symptoms were associated with lower FIM, and the strongest associations of QOL with post stroke depression were found for PF and SF, VT, GH, and MH dimensions.

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