



RESEARCH ARTICLE

Post stroke depression and related factors

Mustafa Aziz Yildirim¹, Kadriye Ones¹

¹University of Health Sciences Istanbul Physical Medicine and Rehabilitation Education and Research Hospital, Department of Physical Medicine Rehabilitation, Istanbul - Turkey

ABSTRACT

Objective: Depressive symptoms are frequently observed in patients with stroke. In this study, we investigated the prevalence of depression and the factors affecting depression in patients with chronic stroke.

Method: The study included 90 patients having had sustained a stroke attack at least 6 months previously. The demographic characteristics, time since stroke, hemiplegic side, etiology of stroke, stroke-related risk factors, complications and accompanying neurological disorders, drug use, and the presence of additional diseases were questioned. Depressive symptoms were assessed by using the Beck Depression Scale (BDS). The patients were divided into two groups according to the BDS score: group 1 included those with depression (BDS score ≥ 17), and group 2 included those without depression (BDS score < 17).

Results: The mean age of the patients was 62.81 ± 12.45 years. Thirty-nine (43.3%) patients were found to have depression. The proportion of widows in the depression group was found to be statistically significantly higher ($p=0.002$). The proportion of cases with urinary incontinence, hypertension, cardiac disease and age risk factors was found to be statistically significantly higher in the group with depression ($p<0.05$).

Conclusion: Depression symptoms are common in the chronic period after stroke. The effects of patient age, gender, marital status, secondary diseases developing with stroke and complications on the development of post-stroke depression are the subjects that need to be investigated.

Keywords: Complication, depression, stroke.

INTRODUCTION

Stroke is a condition characterized by vascular-induced, often rapidly developing, focal brain injury symptoms and findings. Every year, around 15 million people in the world suffer a stroke, 5 million people lose their lives due to stroke and 5 million people suffer permanent damage (1,2). A wide range of affective and behavioral disorders emerge following a stroke. These disorders are depression, mania, bipolar disorder, anxiety disorder, apathy, and pathological crying and laughter (3).

Depression is the most frequently observed emotional disorder after stroke, and it is one of the main causes of disability, loss of function and incapacity to work among all chronic diseases, due to its prevalence and being a chronic disease (4). It has been reported that the period with the highest risk of depression after stroke (DAS) is the first two years. The course of the disease in depression after a stroke is usually between 6 months and a year. While the prevalence of a major depression tends to decrease in the first two years after a stroke, minor depressive symptoms follow a much more variable

How to cite this article: Yildirim MA, Ones K. Post Stroke Depression and Related Factors. Dusunen Adam The Journal of Psychiatry and Neurological Sciences 2019;32:52-57.

Correspondence: Mustafa Aziz Yildirim, University of Health Sciences Istanbul Physical Medicine and Rehabilitation Education and Research Hospital, Department of Physical Medicine Rehabilitation, Istanbul - Turkey

Phone: +90 212 496 50 00 **E-mail:** mustafaaziz1907@hotmail.com

Received: October 25, 2018; **Revised:** November 19, 2018; **Accepted:** December 20, 2018

course, and depression takes a chronic form in certain patients (5,6). The etiology of DAS is not fully known. The development of DAS has a multifactorial etiology. In addition to the neurochemical changes created by cerebral lesions, psychological devastation caused by functional incompetence is effective in the development of depression (7). Early diagnosis and treatment of depression, which is a common complication in patients with stroke, is very important due to its positive effect on the course and prognosis of the disease.

In this study, we aimed to identify the prevalence of depression symptoms and the factors that may be related to depression in patients with chronic stroke. We also aimed to investigate the relationship between depression after a stroke and pathologies, stroke risk factors and complications that accompany the stroke.

METHOD

A total of 90 patients were included in the study. They were those who had developed hemiplegia after a cerebrovascular event (CVE) and were undergoing inpatient rehabilitation.

The patients who had sustained a stroke attack 6 months previously or earlier were included in the study. There was no restriction on a specific age range for the patients who were included in the study. The exclusion criteria for patient selection:

1. Patients who suffered from traumatic and tumoral causes of stroke other than CVE
2. Patients with bilateral stroke with lesions in both hemispheres
3. Those with a history of more than one cerebrovascular disease
4. Patients with a history of psychiatric illness or using antidepressant medication before stroke
5. Patients with aphasia and a high degree of communication impairments

Many patient-related factors were questioned, including demographic characteristics (age, gender, occupation, educational status, and marital status), time since stroke, hemiplegic side, dominant hand, etiology of stroke, stroke-related risk factors (hypertension (HT), diabetes mellitus (DM), hyperlipidemia (HL), cardiac disease (CD), smoking, age (being 65 years old or older), and family history), complications (shoulder pain, complex regional pain syndrome, heterotopic ossification, deep vein thrombosis, and pressure injury), accompanying neurological disorders (aphasia, dysarthria, dysphagia, hemianopsia, urinary and fecal incontinence), drug use and the presence of additional

diseases. Their upper and lower extremities were examined for spasticity, and their spasticities were evaluated according to the Modified Ashworth Scale.

The Beck Depression Scale (BDS) was used to assess depression. BDS was developed by Beck et al. to measure the behavioral symptoms of depression in adolescents and adults (8). The validity and reliability of BDS for the Turkish population was test by Hisli (9). The patients were divided into two groups according to the BDS score: group 1 included those with depression (BDS score ≥ 17), and group 2 included those with no depression (BDS score < 17).

The participants were informed about the study. Those who accepted were informed based on the informed consent form and their signatures were received. Ethical approval was obtained from the local institutional ethics committee.

Statistical Analysis

In this study, the statistical analyses were carried out using the NCSS (Number Cruncher Statistical System) 2017 Statistical Software (Utah, USA) package program. In addition to methods of descriptive statistics (means and standard deviations), independent samples t-tests were used to compare binary groups, and chi-square tests were used to compare qualitative data. The results were judged at $p < 0.05$ level of significance.

RESULTS

Of the 90 patients with stroke, 45 were female and 45 were male. The mean age of the cases was 62.81 ± 12.45 years. The youngest patient was 32 years old, and the oldest patient was 85 years old. The group with no depression mean age was 60.35 ± 12.46 years, while depression group was 66.03 ± 11.83 . Age was statistically significantly higher in the group with depression ($p = 0.031$, $t = -2.240$). Considering the educational levels of the cases, 15 patients were illiterate, 5 patients were literate, 46 patients were elementary school graduates, 11 were middle school graduates, 7 were high school graduates, and 6 were university graduates. The mean educational status of all cases was 5.30 ± 3.92 years. The time since stroke until the date of questioning varied between 6 months and 48 months. The mean time since stroke was 16.21 ± 10.59 months. The patients' mean Beck Depression Scale (BDS) score was 14.83 ± 8.22 . The ratio of the cases with a BDS score of 17 or above was 43.33% ($n = 39$). The group with depression symptoms had a mean BDS score of 22.49 ± 5.81 . The group with no depression had a mean BDS score of 8.98 ± 3.74 . The

mean BDS score of the patients with left hemisphere lesions was 14.34 ± 7.51 , and that of the patients with right hemisphere lesions was 15.34 ± 8.96 . There was no statistically significant difference between the two groups ($p > 0.05$). The depression rate was found to be 64% ($n=25$) in patients with time since stroke between 6 and 12 months; 21% ($n=8$) in patients with time since stroke between 13 and 24 months; and 15% ($n=6$) in patients with time since stroke between 25 and 48 months. The mean age of the group with depression was found to be statistically significantly greater than the group with no depression ($p=0.031$). Considering marital statuses, the proportion of widows in the depression group was found to be statistically significantly higher ($p=0.002$, $\chi^2=12.43$). There was no significant difference between the two groups in terms of averages of gender and educational experience ($p > 0.05$) (Table 1). There was no statistically significant difference between the two groups in terms of time since stroke, dominant hand, stroke type and

hemiplegic side ($p > 0.05$) (Table 2). The proportion of cases with hypertension, cardiac disease and age (being 65 years old or older) risk factors was found to be statistically significantly higher in the group with depression symptoms [respectively ($p=0.039$, $\chi^2=4.261$) ($p=0.024$, $\chi^2=5.095$), ($p=0.049$, $\chi^2=3.875$)]. There was no statistically significant difference between the two groups in terms of DM, HL, smoking and family history risk factors ($p > 0.05$) (Table 3). Considering the post-stroke accompanying pathologies, the proportion of patients with urinary incontinence was statistically significantly higher in the group with depression ($p=0.026$, $\chi^2=4.956$). There was no statistically significant difference between the two groups in terms of spasticity, dysarthria, dysphagia, hemianopsia and fecal incontinence ($p > 0.05$) (Table 4). Considering the post-stroke secondary complications, a statistically significant relationship was found between depression symptoms and shoulder pain ($p=0.031$, $\chi^2=4.653$) (Table 5).

Table 1: Relationship between sociodemographic variables and depression

	Depression (-) (n=51)		Depression (+) (n=39)		χ^2/t test	p
	Mean/n	SD/%	Mean/n	SD/%		
Age	60.35	12.46	66.03	11.83	$t=-2.240$	0.031
Education level (years)	5.43	3.54	5.13	4.4	$t=-0.363$	0.718
Gender						
Male	29	56.86%	16	41.03%	$\chi^2=2.22$	0.136
Female	22	43.14%	23	58.97%		
Marital status						
Married	47	92.16%	26	66.67%	$\chi^2=12.43$	0.002
Single	2	3.92%	1	2.56%		
Widow	2	3.92%	12	30.77%		

χ^2 : chi-squared test, t test: Student's t-test, SD: Standard deviation

Table 2: Relationship between the two groups according to clinical variables

	Depression (-) (n=51)		Depression (+) (n=39)		χ^2/t test	p
	Mean/n	SD/%	Mean/n	SD/%		
Duration (months)	17.98	11.58	13.9	8.75	$t=-1.864$	0.070
Dominant hand						
Right	44	86.27%	35	89.74%	$\chi^2=0.2473$	0.619
Left	7	13.73%	4	10.26%		
Etiology						
Ischemic	39	76.47%	31	79.49%	$\chi^2=0.1164$	0.733
Hemorrhagic	12	23.53%	8	20.51%		
Hemiplegic side						
Right	26	50.98%	20	51.28%	$\chi^2=0.0008$	0.977
Left	25	49.02%	19	48.72%		

χ^2 : chi-squared test, t test: Student's t-test, SD: Standard deviation

Table 3: Differences between groups with and without depression according to stroke risk factors

	Depression (-) (n=51)		Depression (+) (n=39)		χ^2	p
	n	%	n	%		
Diabetes mellitus	15	29.41	13	33.33	0.1591	0.690
Hypertension	35	68.63	34	87.18	4.2610	0.039
Cardiac disease	12	23.53	18	46.15	5.0950	0.024
Hyperlipidemia	8	15.69	4	10.26	0.5631	0.453
Use of cigarettes	10	19.61	7	17.95	0.0397	0.842
Elderly (being 65 years old or older)	17	33.33	21	53.85	3.8750	0.049
Family history	5	9.80	5	12.82	0.2034	0.652

 χ^2 : chi-squared test**Table 4: Relationship between depression and concomitant pathologies after stroke**

	Depression (-) (n=51)		Depression (+) (n=39)		χ^2	p
	n	%	n	%		
Spasticity	35	68.63	25	64.10	0.2034	0.652
Dysarthria	18	35.29	14	35.90	0.0034	0.953
Dysphagia	4	7.84	3	7.69	0.0006	0.979
Hemianopsia	0	0.00	1	2.56	1.3230	0.250
Urinary incontinence	6	11.76	12	30.77	4.9560	0.026
Fecal incontinence	6	11.76	5	12.82	0.0227	0.880

 χ^2 : chi-squared test**Table 5: Relationship between depression and secondary complications after stroke**

	Depression (-) (n=51)		Depression (+) (n=39)		χ^2	p
	n	%	n	%		
Shoulder pain	28	54.90	30	76.92	4.6530	0.031
Complex region pain syndrome	6	11.76	4	10.26	0.0511	0.821
Decubitus ulcer	2	3.92	0	0.00	1.5650	0.211

 χ^2 : chi-squared test

DISCUSSION

According to the results of our study, depression in the chronic period after stroke is common, and the severity of depression increases due to being a widow, hypertension, cardiac disease, advanced age and urinary incontinence.

It has been reported in the literature that the prevalence of depression after stroke (DAS) is between 29–36% (10). The methods, inclusion criteria, and differences in the time period until the diagnosis of depression after stroke, which are being used in studies in the literature, may explain this wide range and the cause of the conflicting results. Moreover, vegetative findings and cognitive functions that arise due to ischemic injury in the early period can be confused with the symptoms of depression (11). Considering that this situation may cause difficulties in differential diagnoses

by increasing the diagnostic difficulty, we carried out our study with patients in the chronic period after stroke.

The development of DAS has a multifactorial etiology. Depression emerges as a psychological response when complex pre-stroke personal and social factors experienced by the person are joined with post-stroke social handicaps and incompetencies. In the studies to explain the etiology of DAS, the psychological response to the incompetency, especially after the stroke, and the local damage occurring in the areas related to emotions in the brain are emphasized (12,13). The belief that Major Depression (MD) and DAS are two different diseases suggests that there are also differences in the mechanisms of emergence of these diseases. Gainotti et al. have argued that post-stroke disability causes depression, whereas endogenous depression is caused by psychological factors. For this reason, they have emphasized the necessity to consider the pre-stroke

history of psychiatric illnesses in order to understand the etiology (13). In our study, the psychiatric situation was questioned in the pre-stroke history taken from the patient and the family, and the patients with a psychiatric history were not included in the study because they were thought to affect the results of our study.

It has been shown in various studies that conditions such as the lack of social support, being a widow, and living alone pave the way for depression. We found that the prevalence of depression symptoms was significantly higher in the cases of widows in our study, too. In contrast to the study of Morris et al. stating that the development of DAS is more common in males, it has been reported in the study of Baltimore that depression develops in females twice as much as in males. However, the general opinion in the literature is that there is no correlation between gender and prevalence of depression (14,15,16). Although the mean BDS score of female patients was greater than that of males in our study, there was no statistically significant difference between depression and gender. This finding parallels the opinions that MD and DAS are two different diseases and that their emergence mechanisms may differ (13). In studies investigating the relationship between post-stroke depression and stroke etiology, it has been reported that whether the lesion type is ischemic or hemorrhagic does not have any relationship with depression (17,18). In our study, we observed that 77% of the cases were ischemic type, and 22% were hemorrhagic type. In accordance with the literature, there was no correlation between stroke type and depression symptom in our study, either. The relationship between depression and age after stroke is also one of the topics that has been discussed. In a population study in China, it was found that depressive symptom scores in patients with stroke were significantly correlated with the daily life activities and age of the patients (19). No relationship could be found between age and DAS in the results of some of the studies in the literature (20,21). In accordance with the literature, there was a significant correlation between depression symptoms and age in our study too. When the risk factors of the patients were considered together with their histories, hypertension, age, cardiac disease, diabetes mellitus, smoking, hyperlipidemia and family history were present in the given order of frequency. Hypertension, which is among the major risk factors was recapitulated to rank first in terms of the incidence of stroke in our study in parallel with the literature. It is known that in cases of coronary artery disease, congestive heart failure and DM, which are significant risk factors for stroke, the prevalence of depression also increases,

and antihypertensive drug use can also cause depressive symptoms (22,23). In our study, it was found that the prevalence of depression symptoms was significantly higher in the patients with hypertension and cardiac disease risk factors.

Considering the accompanying pathologies in the postoperative period of the patients included in the study, spasticity, dysarthria, urinary incontinence, fecal incontinence, dysphagia and hemianopsia were present in the given order of frequency. We consider that the patients that we assessed in this study also had severe motor and cognitive deficiencies, which may also be associated with severe spastic hypertonia (25). We also identified the prevalence of dysarthria, urinary incontinence, fecal incontinence and dysphagia in our study. Considering the relationship between the accompanying pathologies and depression after stroke, we found a significant correlation between urinary incontinence and depression symptoms. We believe that the presence of urinary incontinence is associated with affecting functional condition, being correlated with the lesion area and preventing social integration.

Post-stroke secondary disorders and complications that develop subsequently affect stroke rehabilitation negatively. The hemiplegic shoulder pain is also one of these complications. There are studies stating that hemiplegic shoulder pain is not uncommon, and that there is a relationship between hemiplegic shoulder pain, and prolonged hospitalization time, arm weakness, functional recovery, quality of life and depression (25,26). In our study, the prevalence of shoulder pain was found to be 64%, consistent with the literature. There was a significant relationship between depression symptoms and shoulder pain. However, we could not find a significant relationship between depression symptoms and the Complex Regional Pain Syndrome, and between depression symptoms and decubit ulcer.

We have some limitations in our study. We have a small number of stroke patients and only beck depression scale was used to assess depression in our study. The fact that we did not use DSM criteria and clinical interview for the detection of depression can be considered as the limitation of our study.

The distressed mood, weakness, reluctance, pessimism, slowdown in physiological functions brought by depression affect participation in rehabilitation programs. Factors such as patient age, gender, educational level, pre-stroke existing psychiatric disorders, localization of the affected area are some of the issues whose effects on DAS need to be investigated. We think that early diagnosis and treatment of

secondary diseases and complications that develop in the stroke may reduce the depression that is developed after the stroke. In order to more clearly reveal the relationship between stroke and depression, it is necessary to work with a greater number of patients and control groups.

Contribution Categories		Author Initials
Category 1	Concept/Design	K.O., M.A.Y.
	Data acquisition	K.O., M.A.Y.
	Data analysis/Interpretation	K.O., M.A.Y.
Category 2	Drafting manuscript	K.O., M.A.Y.
	Critical revision of manuscript	K.O., M.A.Y.
Category 3	Final approval and accountability	K.O., M.A.Y.
Other	Technical or material support	K.O., M.A.Y.
	Supervision	K.O.

Ethics Committee Approval: Ethics approval had been obtained from the local institutional Ethics Committee.

Informed Consent: Written consent was obtained from the participants.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The authors declared no conflict of interest.

Financial Disclosure: The authors declared no financial support.

REFERENCES

- Torbey MT, Selim MH (editors). The Stroke Book. Second ed., Cambridge: Cambridge University Press, 2013, 12-13.
- WHO. Global Status Report on Noncommunicable Diseases 2014. <http://www.who.int/nmh/publications/ncd-status-report-2014/en/>. Accessed February 2, 2018.
- Robert GR. Neuropsychiatric consequences of stroke. *Annu Rev Med* 1997; 48:217-229.
- Bozulolcay M, Ince B. Post-stroke depression. *Turkiye Klinikleri Journal of Neurology* 2004; 2:57-61. (Turkish)
- Whyte EM, Mulsant BH. Post stroke depression: epidemiology, pathophysiology, and biological treatment. *Biol Psychiatry* 2002; 52:253-264.
- Verdelho A, Henon H, Lebert F, Pasquier F, Leys D. Depressive symptoms after stroke and relationship with dementia: a three-year follow-up study. *Neurology* 2004; 62:905-911.
- Karahan AY, Kaydok E. Depression and anxiety levels in geriatric patients with hemiplegia. *The Medical Bulletin of Sisli Etfal Hospital* 2013; 47:130-137.
- Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961; 4:561-571.
- Hisli N. The validity and reliability of Beck Depression Inventory for university students. *Turkish Journal of Psychology* 1989; 7:3-13. (Turkish)
- Hackett ML, Pickles K. Part I: frequency of depression after stroke: an updated systematic review and meta-analysis of observational studies. *Int J Stroke* 2014; 9:1017-1025.
- Robinson RG. Poststroke depression: prevalence, diagnosis, treatment and disease progression. *Biol Psychiatry* 2003; 54:376-387.
- Altinbas K, Oral ET, Soysal A. Poststroke depression. *Turkish Journal of Clinical Psychiatry* 2006; 9:148-153. (Turkish)
- Gainotti G, Azzoni A, Marra C. Frequency, phenomenology, and anatomical-clinical correlates of major post-stroke depression. *Br J Psychiatry* 1999; 175:163-167.
- Morris P, Robinson R, Raphael B, Bishop D. The relationship between the perception of social support and post-stroke depression in hospitalized patients. *Psychiatry* 1991; 54:306-316.
- Paradiso S, Robinson RG. Gender differences in poststroke depression. *J Neuropsychiatry Clin Neurosci* 1998; 10:41-47.
- Burvill P, Johnson GA, Jamrozik KD, Anderson JS, Stewart-Wynne EG, Chakera TM. Prevalence of depression after stroke The Perth Community Stroke Study. *Br J Psychiatry* 1995; 166:320-327.
- Kotila M, Numminen H, Waltimo O, Kaste M. Depression after stroke: results of the FINNSTROKE study. *Stroke* 1998; 29:368-372.
- Pohjasvaara T, Leppavuori A, Siira R, Vataja R, Kaste M, Erkinjuntti T. Frequency and clinical determinants of poststroke depression. *Stroke* 1998; 29:2311-2317.
- Nys GM, Van Zandvoort MJ, Van der Worp HB, DeHaan EH, de Kort PL, Kappelle LJ. Early depressive symptoms after stroke: neuropsychological correlates and lesion characteristics. *J Neurol Sci* 2005; 228:27-33.
- Fuh JL, Liu HC, Wang SJ, Liu CY, Wang PN. Poststroke depression among Chinese elderly in a rural community. *Stroke* 1997; 28:1126-1129.
- Dilek A, Karatas M, Erkan H, Cetin N, Akman MN. Post-stroke depression; relationship to functional impairment and rehabilitation outcome. *Turkish Journal of Physical Medicine and Rehabilitation* 2005; 51:120-122. (Turkish)
- Kumral E, Ozkaya B, Sagduyu A, Sirin H, Vardarli E, Pehlivan M. The Ege Stroke Registry: A hospital-based study in the Aegean region, Izmir, Turkey. Analysis of 2,000 stroke patients. *Cerebrovasc Dis* 1998; 8:278-288.
- Karatepe AG, Kaya T, Sen N, Gunaydin R, Gedizlioglu M. The Risk Factors in Patients with Stroke and Relations with Functional Independence. *Turkish Journal of Physical Medicine and Rehabilitation* 2007; 53:89-93. (Turkish)
- Francisco GE. How common is spastic hypertonia after stroke? 2002 Academy Annual Assembly Abstracts. *Arch Phys Med Rehabil* 2002; 83:1644-1645.
- Snels IA, Beckerman H, Lankhorst GJ, Bouter LM. Treatment of hemiplegic shoulder pain in the Netherlands: results of a national survey. *Clin Rehabil* 2000; 14:20-27.
- Bender L, McKenna K. Hemiplegic shoulder pain: defining the problem and its management. *Disabil Rehabil* 2001; 23:698-705.