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ORIGINAL PAPER

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# Post-Stroke Depression

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## ABSTRACT

**Introduction:** The depression is a common mental disorder, especially after a stroke, which further aggravates the recovery. **Aim:** To analyze depression within 48 hours and fifteen days after ischemic stroke in relation to gender and location (brain hemisphere and brain circulation). **Methods:** We analyzed 40 patients (65.3±10.3 years), half of them were women. Mean age of women was 66.35±7.31 years and men 64.2±12.68 years ( $p=0.5$ ). Ischemic stroke was verified by computed tomography. Levels of depression were measured with self-estimated Zung's scale. On the tests, score of 50 and higher verified depression. Criteria made by Domasio were used to determine location of the IS. **Results:** Mean value on depression scale in acute phase of ischemic stroke was  $46.85 \pm 8.6$  and in subacute phase  $43.4 \pm 8$  ( $p=0.06$ ). In 19 (47.5%) patients (55% of women, 40% of men;  $p=0.3$ ) depression was found during the first and in 10 (25%) patients (35% of women, 15 % of men;  $p=0.06$ ) during the second evaluation ( $p<0.019$ ). Mean value on depression in acute phase of illness in women was  $49.1 \pm 7.38$ , as well as in men  $44.6 \pm 9.22$  ( $p=0.088$ ) and in subacute phase in women  $45.25 \pm 8.04$ , as well as in men  $41.5 \pm 7.75$  ( $p=0.16$ ). Concerning location of ischemic stroke, there were no significant differences in levels of depression. **Conclusion:** Number of patients with post-stroke depression is significantly lower in subacute phase of ischemic stroke. Although the number of depressive women and their depression scores are higher, gender differences are not statistically significant. There is no correlation between post-stroke depression and location of lesion in acute and subacute phase of illness.

**Keywords:** Cerebrum, Depression, Sex, Stroke.

## 1. INTRODUCTION

Ischemic stroke (IS) is a rapid clinical sign of development (focal or global) of brain function disorder with symptoms lasting 24 hours or longer, or leading to death, with no clear other cause but blood vessel destruction (1). Accord-

ing to the report of World Health Organization (WHO), there are 15 million people suffering from stroke every year (2). Unfortunately, mood and emotional disturbances are frequent problems in stroke survivors (3). They are distressing for patients and their caregivers, with negative influence on quality of life both of them. Mood disorders include post-stroke depression (PSD), post-stroke anxiety, post-stroke emotional incontinence, post-stroke anger proneness, as well as post-stroke fatigue (4, 5). Emotional disturbances are not apparent and therefore are often unnoticed by busy clinicians. Their phenomenology, predicting factors, and pathophysiology have been under-studied and under-recognized (6). According to few older investigations, PSD is present in 20-55 % of the patients in acute phase of IS (7, 8, 9).

## 2. AIM

Aim of our study was to analyze rising of depression in acute and subacute phase of IS in relation to gender and location of the brain lesion (brain hemisphere/brain circulation).

## 3. METHODS

We analyzed 40 consecutively recruited patients (gender ratio 20:20) hospitalized for the first IS at Department of Neurology, University Clinical Center Tuzla, Bosnia and Herzegovina. Mean age of patients was 65.3±10.3 years (Women 66.35±7.31 / Men 64.2±12.68) ( $p=0.5$ ). Exclusion criteria for our experimental group were: loss of consciousness, aphasia, neglect, history of mental disorders and previous IS. In our experimental groups, IS was verified after neurological examination and computed tomography of the brain (for some of them we used magnetic resonance imaging). Our patients, due to their current neurological status, were able to answer on 20 questions contained in self-estimated depression scale made by Zung (10). This scale was compared to other screening methods in

geriatric stroke patients and assessed with a high positive predictive value (11). Level of depression was measured within 48 hours and fifteen days after IS (acute and subacute phase). Score of 50 and higher was verification of some kind of depression. Criteria made by Domasio were used to determine location of IS (12). Our investigation was conducted in accordance with the World Medical Declaration of Helsinki (Ethical principles for medical research involving human subjects from 1975 and its amendments), with the full understanding and the written informed consent of the participants. The Ethical Committee of University Clinical Center Tuzla has approved experiments in our study. Standard statistical test have been used: mean value, t-test and Chi-square test ( $\chi^2$ -test). A statistical significance level of 95% ( $p < 0.05$ ) was considered to be the limit for all tests.

#### 4. RESULTS

Mean value on Zung's scales in acute phase of IS was  $46.85 \pm 8.6$  (29-65) and it was verified in 19 (47.5%) patients. In subacute phase of IS mean value was  $43.4 \pm 8$  (26-59), what was almost significantly different to level of depression within 48 hours ( $p = 0.06$ ). Depression persisted during the second evaluation in 10 (25%) patients ( $p < 0.019$ ) (Figure 1).

Mean value on Zung's scales in acute phase of IS in women was  $49.1 \pm 7.38$  (38-65) and in men  $44.6 \pm 9.22$  (29-59) ( $p = 0.088$ ). Depression was registered in 11 women (55%) and 8 men (40%) ( $p = 0.3$ ). Mean value on Zung's scales in subacute phase of IS in women was  $45.25 \pm 8.04$  (31-59) and in men  $41.5 \pm 7.75$  (26-55) ( $p = 0.16$ ). Depression was registered in 7 women (35%) and 3

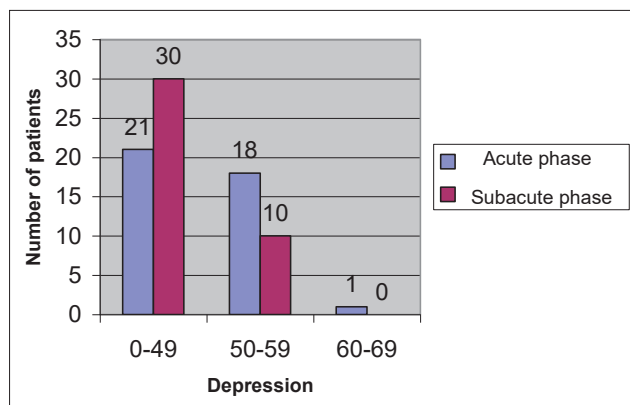


Figure 1. Depression in acute and subacute phase of ischemic stroke. 0-49: normal; 50-59: minor to moderate depression; 60-69: moderate to severe depression

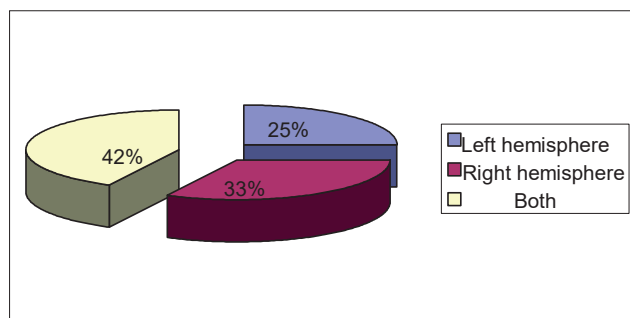


Figure 2. Distribution of ischemic stroke in relation to brain hemisphere

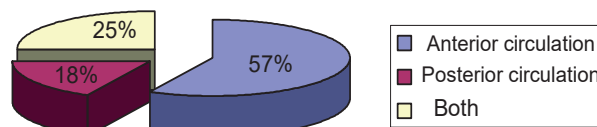


Figure 3. Distribution of ischemic stroke in relation to brain circulation

men (15%) ( $p = 0.06$ ).

Mean value on Zung's scales in acute phase of IS in right hemisphere was  $47.1 \pm 7.25$  and in left hemisphere  $48.8 \pm 10.1$  ( $p = 0.639$ ). The results in subacute phase of IS were: to the right hemisphere  $43 \pm 7.5$  and to the left hemisphere  $41.9 \pm 6.4$  ( $p = 0.71$ ) (Figure 2). Concerning the brain circulation (anterior/posterior), there were no significant differences in mean values on Zung's scales in acute phase of IS -  $47.26 \pm 7.59$ ;  $49.42 \pm 11.98$  ( $p = 0.564$ ). Furthermore, in subacute phase results were  $44.4 \pm 7.7$  and  $43.4 \pm 9.4$  ( $p = 0.775$ ) (Figure 3).

#### 5. DISCUSSION

PSD is defined as a depression that did not exist before the stroke and occurred in chronological context to a stroke. PSD can occur shortly after begin of illness, but is a frequently observed condition in the weeks and months following an acute / subacute phase (13, 14, 15).

General, patients with PSD have more functional disability, poorer rehabilitation outcomes, and increased morbidity and mortality in the first year after stroke onset (16). Therefore, it is very important to find out the risk factors for PSD, and difference between of the clinical presentation some of them.

In our study, number of patients with depression is significantly lower in subacute phase of IS. PSD persisted in the first month after IS in 25% of patients. It was similar to recent systematic reviews which indicate the frequency of PSD in about 30% of survivors (17, 18). Interestingly, due to our result, number of patients with PSD is lower in subacute phase of illness and, in regards to gender, almost show significant difference ( $p = 0.06$ ). Unfortunately, women are considered to be more likely diagnosed with some psychiatric disorders, also for PSD during acute and subacute phase of illness (19, 20, 21). Oppositely, Ayerbe et al. (2011) failed to find this association (22).

Stroke severity could be one of the most important risk factors for PSD. Movement disorders, dysfunction, and life obstacles caused by brain damage could probably decline the self-confidence of patients. Also, the laterality was one of the first characteristics of IS. Some authors reported frequent links of ischemic lesion in right hemisphere and PSD (23, 24). However, there are few studies with opposite findings. Due to their results, damage of left hemisphere of the brain, especially in the left frontal lobe and in the left basal ganglia. It had a close association with the extent of PSD in the acute and subacute phase of illness, persistent / recurrent PSD, as well as poor prognosis after a 1 year time span (21, 25). Without exact diagnosis and proper treatment disorder can last up to a year after IS, what

makes an important impact on the processes of recovery and quality of life (26).

Due to our result, decrease of mean value of depression was observed in patients with IS in posterior circulation of the brain, but not significantly. According to Dennis et al., patients with IS in posterior circulation show better emotional recovery (7). Furthermore, there were no differences in mean values of Zung's scales according to brain hemisphere and brain circulation. Similarly, few systematic reviews and meta-analysis suggest that there is no evident relationship between PSD and a specific location of ischemic lesion (27, 28).

At present, the neurobiological mechanisms of PSD remain unclear, but the inflammatory factors and other biochemical factors, provide new directions for the prediction of PSD.

PSD is a common problem in daily clinical practice since it is present in 1 out of every 3 stroke patients. More than half of the cases are neither diagnosed nor treated which is a fact that should alert us. In this very unpopular scenario, neurologists play a major role in caring for and managing recovery in stroke patients, and therefore, they must be so familiar with early detection and treatment of PSD (29).

Negative influence of PSD on patient's health is evident. Maybe, the benefit for patients in acute and subacute phase of IS could be higher if PSD would be considered more carefully, followed by an adequate selection and proper plan of medicament and psychotherapeutic approach.

Limitations of our study are: lack of information of stressful life events before IS, sample size, exclusion criteria of speech disorders and neglect (presumably more or less PSD in these two groups of patients), but also absence of comparing our results with severity of IS, age groups as well as level of education. Those are the reasons that justify creation of more comprehensive studies that would overcome current limitations.

## 6. CONCLUSION

Number of patients with PSD is significantly lower in subacute phase of IS. Although the number of depressive women and their depression scores are higher, gender differences are not statistically significant. There is no correlation between PSD and location of lesion in acute and subacute phase of illness.

- Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms
- Author's contribution: O.C.I. and Dz.S. gave substantial contributions to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. S.K. had a part in article preparing for drafting or revising it critically for important intellectual content, and each author (O.C.I., Dz. S., S.K., Z. D., A.C., A.S. and B. K. gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Financial support and sponsorship: Nil.
- Conflict of interest: There are no conflicts of interest.

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The image shows the homepage of the European Public Health Association (EUPHA). At the top, there is a navigation bar with links for Home, Member login, @EUPHActs, and Contact. A 'NEWSLETTER SUBSCRIPTION' button is also present. The main header features the EUPHA logo and a large photograph of a diverse group of people smiling. Below this, a vertical menu on the left lists various sections: About us, EUPHA 2014 - 2020, Members, EUPHA Sections, Public Health WEEK 2019, EUPHAnxt, Conferences, EJPH, Advocacy, and News and Projects. The central content area is divided into three columns. The first column, 'CURRENT NEWS', contains three articles: 'EUPHA publishes e-collection on antimicrobial resistance (AMR)', 'EUPHA co-signs letter to WHO to express concern at the attempt by the Philip Morris International-funded entity, Foundation for a Smoke-Free World (FSFW) to pave the road for partnership with WHO', and 'Prof Walter Ricciardi steps down as president of the Italian Public Health Institute'. The second column, 'RECENT TWEETS', shows three tweets from EUPHA (@EUPHActs) and Natasha Azzopardi M (@natasha\_azzmus). The third column, 'ACTIVITIES', features four sections: 'EPH Conference' (EPH Marseille 2019), 'EJPH' (European Journal of Public Health), 'Advocacy', and 'Join us' (Join our network).