

## Depression Severity and Subjective Cognitive Impairment in Elderly

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### ABSTRACT

**Objective:** The study aimed to find a correlation between depression severity and subjective cognitive deficit in the elderly.

**Method:** The design was cross-sectional and 131 depressive patients at the age of or above 65 years were investigated – 26 men and 105 women. The control group contained 50 people – 15 men and 35 women. The middle age of the participants was 71.77 (SD=5.80). Hamilton depression rating scale of 24 items was used to assess the severity of depression. Subjective cognitive impairment was evaluated with Perceived Deficit Questionnaire for Depression – 5 items (PDQ-D5). Subjectively perceived executive functions, attention and concentration, prospective and retrospective memory were assessed and the results were compared between the different severity groups and controls.

**Results:** A positive correlation between depression severity and subjective cognitive impairment was found ( $p < 0,05$ ). Executive functions were mostly impaired in severe depression (4,71) compared to mild (2,35), moderate depression (3,16) and controls (0,74) ( $p < 0,05$ ). Attention and concentration were significantly more impaired in severe depression (3,19) compared to moderate (2,12), mild depression (1,05) and controls (0,40) ( $p < 0,05$ ). Mild depression and controls did not reach a statistically significant difference. Prospective memory significantly differed only in severe depression compared to controls (1,68 vs. 0,58;  $p < 0,05$ ). There was no statistically significant difference in retrospective memory in all severity groups and controls.

**Conclusion:** A positive correlation between depression severity and subjective cognitive dysfunction was found. The most impacted cognitive domains were executive functions and attention and concentration.

### INTRODUCTION

According to different studies, the percentage of the aging population increases, and 6-20% of the elderly have depressive symptoms [1]. Depression is the leading cause of psychiatric hospitalizations in the elderly population and is associated with increased medical burden, increased usage of health care, longer hospital length, and disability, compared to other somatic diseases [2]. Even mild depression is a risk factor for neurocognitive disorders [3].

Depression is a disorder, which impacts not only the physical and emotional state but also the cognition. Changes in cognition appear in different domains, such as memory, concentration, psychomotor impairment, speed of thinking, and decision making [4].

Cognitive dysfunction in depression is reversible, unlike the progressive cognitive dysfunction in dementia. Nevertheless, any studies have shown that cognitive deficit in the elderly is very common also after the treatment of depressive symptoms and often is accepted as residual symptomatology [5].

We have to consider that age-specific changes occur in cognitive functioning. On the one hand, these cognitive changes can be objectively assessed by different neurocognitive tests. On the other, there is the subjective acceptance of cognitive "dysfunction". This self-experience of disturbance in cognitive performance is known with the generalized term - subjective cognitive impairment. Subjective Cognitive Impairment (SCI) is more common during the depression and correlates more accurately with impaired life functioning than objective [6]. Around 15 - 50% of the elderly share such perceived decline [7]. SCI is connected with depression and with future objective cognitive decline, especially in the older population [7,8]. There are many studies about the relationship between SCI and depression and the lack of association between SCI and objective cognitive impairment [9,10]. Different measurements are used to assess SCI. Some of them are self-rated others are informant-rated [11]. Self-rated tests are more associated with mood disorders [11]. One of the scales with high reliability is the Perceived Deficits Questionnaire (PDQ) [12]. PDQ was first used to assess cognitive difficulties in people with multiple sclerosis, but during the evaluation was found that PDQ correlates more with the presence of depression [13]. There are two versions of PDQ with 20 and 5 items. For depression, the short five items version is mainly used (PDQ-D5) [14].

The current study aimed to establish the association between the severity of depression and SCI in people of the age or above 65 years old. We hypothesized that SCI is impacted by the severity of depression, and a difference between healthy elderly and elderly with mild, moderate, and severe depression would be established.

## MATERIALS AND METHODS

### Study design and patients

The study had a naturalistic, cross-sectional design. All patients  $\geq 65$  years old, hospitalized in the psychiatry clinic in University Hospital 'Alexandrovska' for two years (01-Nov-2015 to 01-Nov-2017) and who met the diagnostic criteria of ICD-10 for uni- or bipolar depression were investigated. 131

patients participated in the study. Three diagnostic groups were formed: 29 (22,14%) patients were with first depressive episode at age  $\geq 65$ ; 80 (61,07%) patients were with recurrent depressive disorder, and 22 (16,79%) were with bipolar depression. For the purpose of our study, we also divided the patients by the severity of depression: 21 (16.03%) were with mild depression, 51 (38.93%) with moderate depression and 59 (45.04%) with severe depression. We decided to investigate the participants only by the severity of depression, supposing that the clinical severity is more important for the treatment and the prognosis of depression. Also, subjectively perceived cognitive dysfunction is significantly more impacted by the severity of depression than the diagnosis [15].

The patients were diagnosed by Mini-International Neuropsychiatric Interview (M.I.N.I.) [16] from at least two psychiatrists. The exclusion criteria were:

- All other diagnostic categories
- The presence of severe somatic and neurologic disease
- Clinical data of dementia

The patients, who participated in the study, were recruited in the hospital. They were investigated during the first three days of their acceptance in the hospital. The inclusion criteria were to be at the age of or above 65 years old and to be with depressive episode. All patients who answered the inclusion criteria and signed informed consent were included in the study. They were assessed in a quiet room only by the investigator. Firstly, some demographic facts were selected and then the two assessment tools were applied. Participation or non-participation was irrelevant to the therapeutic strategy. The control group was recruited outside the hospital, and most of the people have attended a retirement club, where they were investigated. The exclusion criteria for the control group were no history or a present psychiatric disease, to be at the age of or above 65 years old, and have no severe somatic and neurological disease or such disease was under control. The study was performed following the ethical standards and approved by the ethical commission of Medical University – Sofia – "Kenimus" (Number: 74)

### Assessment

The clinical assessment was made with Hamilton Depression Rating Scale - 24 items version (HDRS-24 items) [17,18] and

The Perceived Deficits Questionnaire – Depression 5 items – PDQ-D5) [19] (PDQ-D5 was used with the permission of Mapi Research Trust).

Hamilton Depression Rating Scale is a widely spread tool used to measure the severity of depression. Different versions are known. We used the 24 items version because it contains symptoms of worthlessness, helplessness, and hopelessness. We assumed that these 'cognitive' symptoms of depression correlate more strongly with the subjective cognitive disturbance during the depression. 14 of the 24 items are scored from 0-4 and 10 from 0-2. The maximal score is 76. Points from 10 to 19 correspond to mild depression, from 20 to 29 to moderate depression, and over 30 to severe depression [13]. The assessment took approximately 20 – 30 minutes. Hamilton Depression Rating Scale is with high reliability and validity (ICC of 0.92) [18].

PDQ-D5 [14,19] is a short version of the introduced by Sullivan 20 items scale (PDQ-20). This scale is one of the few validated self-assessment scales. It is with high reliability (Cronbach's alpha 0.81-0.96) [19]. The evaluation is based on a 5-items Likert scale from 0 to 4 (never, rarely, sometimes, often, and very often). The result varies from 0 to 20 points, and results above 10 points show severe cognitive impairment. This scale correlates with depression, anxiety, fatigue and does not correlate with objectively evaluated cognitive dysfunctions [20]. PDQ-D5 evaluates how the investigated participants perceive their cognitive performance without any objective cognitive deficit to be registered. This type of cognitive dysfunction is known as subjective cognitive dysfunction and often does not correlate with the objective cognitive dysfunction measured by neurocognitive tests [20]. PDQ-D5 contains four domains that can be separately evaluated. The first domain represented by items 1 and 5 from PDQ-D5 is Executive Functions (EFs). Executive functions are a set of cognitive abilities used to control behaviour. There are three core executive functions: inhibition, working memory, and mental flexibility [21]. The perception of dysfunction of EFs can lead to seriously disturbed daily functioning. Also, the impairment of EFs can lead to dysfunction of the second and third domain of PDQ-D5, item 2 - attention and concentration, and item 3 – prospective memory. Prospective memory is remembering to execute planned in the past action. It contains two components

– EF and retrospective memory [22]. We supposed that if EFs are subjectively perceived as disturbed, attention and concentration and prospective memory could also be accepted as disturbed. The fourth domain assessed by PDQ-D5 is retrospective memory – item 4. Retrospective memory is the memory of all information learned in the past. We supposed that retrospective memory would remain intact because the elderly expect such impairment with aging, and dysfunction in this domain does not disturb daily functioning.

### Statistical analysis

The data was processed with the statistical package IBM SPSS Statistics 25.0. Statistical significance was defined as  $P < 0,05$ . The following methods were used: descriptive analysis, variation analysis, multiple comparisons, alternative analysis, Fisher's exact test, and test  $\chi^2$ , and one factored dispersion analysis ANOVA.

### RESULTS

During the investigated period, 1797 patients were hospitalized. 201 (11%) of them were at the age of and above 65 years old. 136 (68%) of the elderly patients were diagnosed with affective disorders. 26 of them were diagnosed with bipolar disorder (1 with manic episode, 3 with mixed state, and 22 with depression), and the other 110 were with a recurrent or first depressive episode. The inclusion criteria were met by 132 patients, and 131 were investigated (1 patient refused to participate). 26 (19.84%) of all 131 elderly patients were men, and 105 (80.16%) were women. The control group contained 50 people – 15 men and 35 women. The middle age of the participants was 71.77 (SD=5.80) years between the age of 65 and 88. Independently from the diagnosis, the depressed elderly were divided into three groups based on the severity of depression. 21 (16.03%) were with mild depression, 51 (38.93%) with moderate depression, and 59 (45.04%) with severe depression. There were no differences in age and gender in the investigated groups. The level of education was also compared. A significantly higher proportion of the control group had a higher education than patients with severe depression (58% vs. 37,3%) ( $p < 0,05$ ). There was no statistically significant difference in marital status, except between unmarried in severe depression and controls (6,8% vs. 0%) ( $p < 0,05$ ). There were no unmarried controls. The

distribution by socio-demographic factors - age, gender, education, and marital status is presented in table 1.

Table 1: Socio-demographic factors of the investigated groups.

Severity	Mild (n=21)	Moderate (n=51)	Severe (n=59)	controls (n=50)
Age (SD)	69,71 (4,82) <sup>a</sup>	71,73 (5,17) <sup>a</sup>	71,17 (4,96) <sup>a</sup>	73,40 (7,25) <sup>a</sup>
Gender (n%)				
Male	4 (9,8) <sup>a</sup>	8 (19,5) <sup>a</sup>	14 (34,1) <sup>a</sup>	15 (36,6) <sup>a</sup>
Female	17 (12,2) <sup>a</sup>	43 (30,7) <sup>a</sup>	45 (32,1) <sup>a</sup>	35 (25) <sup>a</sup>
Education (n%)				
Without	2 (9,6) <sup>a</sup>	4 (7,8) <sup>a</sup>	6 (10,2) <sup>a</sup>	3 (6,0) <sup>a</sup>
Secondary	12 (57,1) <sup>a</sup>	26 (51,0) <sup>a</sup>	31 (52,5) <sup>a</sup>	18 (36,0) <sup>a</sup>
Higher	7 (33,3) <sup>ac</sup>	21 (41,2) <sup>ac</sup>	22 (37,3) <sup>a</sup>	29 (58,0) <sup>bc</sup>
Marital status (n%)				
Unmarried	1 (4,8) <sup>ac</sup>	3 (5,9) <sup>ac</sup>	4 (6,8) <sup>a</sup>	0 (0) <sup>bc</sup>
Married	12 (57,1) <sup>a</sup>	24 (47,1) <sup>a</sup>	29 (49,2) <sup>a</sup>	27 (54,0) <sup>a</sup>
Widowed	7 (33,3) <sup>a</sup>	16 (31,4) <sup>a</sup>	17 (28,8) <sup>a</sup>	20 (40,0) <sup>a</sup>
Separated/Divorced	1 (4,8) <sup>a</sup>	8 (15,7) <sup>a</sup>	9 (15,3) <sup>a</sup>	3 (6,0) <sup>a</sup>

The same letters on the horizontals mean lack of significant difference and different letters mean a presence of significant difference ( $p < 0.05$ ).

Table 2: The impact of socio-demographic factors on the scores of PDQ-D5.

Variables	PDQ-D5		
	N	$\bar{X}$ *	SD
<b>Gender</b>			
Male	26	7.58 <sup>a</sup>	3.94
Female	105	8.22 <sup>a</sup>	4.64
<b>Education</b>			
Without	12	9.08 <sup>a</sup>	4.81
Secondary	69	8.12 <sup>a</sup>	4.87
Higher	50	7.82 <sup>a</sup>	3.92
<b>Marital status</b>			
Unmarried	8	11.13 <sup>a</sup>	4.52
Married	65	7.69 <sup>bc</sup>	4.55
Widowed	40	7.65 <sup>ac</sup>	4.53
Separated/Divorced	18	9.17 <sup>ac</sup>	3.85

\*The same letters on the verticals mean a lack of significant difference and different letters mean a presence of significant difference ( $p < 0.05$ ).

In table 2 is shown the impact of gender, education and marital status on the scores of PDQ-D5 in patients with depression. Gender and education did not have a significant influence on the subjectively perceived cognitive deficit. Married depressed

elderly had statistically significant less scores of PDQ-D5 than unmarried (7,69 vs. 11,13) ( $p < 0,05$ ). Separated/Divorced and widowed did not differ from married and unmarried. (9,17; 7,65 vs. 7,69 and 11,13). Widowed and married had almost the same results (7,65 vs. 7,69).

The mean score of PDQ-D5 was significantly higher in severe depression (10,34) than in moderate (6,82), mild depression (4,86) and controls (2,68) ( $p < 0,05$ ). Actually, there was a statistically significant progressive worsening between all investigated groups. The subjective cognitive impairment was most pronounced in severe depression. The results are shown in table 3.

Table 3: The correlation between PDQ-D5 and the severity of depression.

Variable	Severity	N	$\bar{X}$ *	SD
PDQ-D5	Mild	21	4,86 <sup>a</sup>	4,11
	Moderate	51	6,82 <sup>b</sup>	3,46
	Severe	59	10,34 <sup>c</sup>	4,35
	Controls	50	2,68 <sup>d</sup>	3,19

\*The same letters on the horizontals mean lack of significant difference and different letters mean a presence of significant difference ( $p < 0,05$ ).

We examined separately the different domains of PDQ-D5 and compared the different severity groups. The mean scores of PDQ1 showed significant impairment in severe depression (4,71) compared to mild (2,19), moderate depression (3,16) and controls (0,74) ( $p < 0,05$ ). There was no difference between mild and moderate depression. In PDQ2, attention and concentration were significantly more impaired in severe depression (3,19) compared to moderate (2,12), mild depression (1,05), and controls (0,40) ( $p < 0,05$ ). Mild depression and controls did not reach a statistically significant difference. Prospective memory (PDQ3) significantly differed only in severe depression compared to controls (1,68 vs. 0,58) ( $p < 0,05$ ). There was no statistically significant difference in retrospective memory (PDQ4) in all severity groups and controls. The results are shown in table 4.

**Table 4: Difference between means of the different PDQ domains.**

PDQ domain	Severity groups (n)	$\bar{X}$ (SD)
<b>PDQ<sub>1</sub></b> Executive function	Mild (21)	2,19 (2,35) <sup>a</sup>
	Moderate (51)	3,16 (1,79) <sup>a</sup>
	Severe (59)	4,71 (2,19) <sup>b</sup>
	Controls (50)	0,74 (1,04) <sup>c</sup>
<b>PDQ<sub>2</sub></b> Attention/ concentration	Mild (21)	1,05 (1,53) <sup>a</sup>
	Moderate (51)	2,12 (1,46) <sup>b</sup>
	Severe (59)	3,19 (0,95) <sup>c</sup>
	Controls(50)	0,40 (0,72) <sup>a</sup>
<b>PDQ<sub>3</sub></b> Prospective memory	Mild (21)	1,05 (1,32) <sup>ac</sup>
	Moderate (51)	1,16 (1,25) <sup>ac</sup>
	Severe (59)	1,68 (1,49) <sup>bc</sup>
	Controls (50)	0,58 (0,82) <sup>a</sup>
<b>PDQ<sub>4</sub></b> Retrospective memory	Mild (21)	0,57 (1,16) <sup>a</sup>
	Moderate (51)	0,39 (0,85) <sup>a</sup>
	Severe (59)	0,69(1,20) <sup>a</sup>
	Controls (50)	0,51 (1,00) <sup>a</sup>

The same letters on the horizontals mean lack of significant difference and different letters mean a presence of significant difference ( $p < 0.05$ ).

## DISCUSSION

In our study, the investigated groups were comparable in age and sex. Only the level of education and marital status differed. In controls, the proportion of subjects with higher education was significantly higher than that in severe depression. Unmarried patients in severe depression were significantly more than controls. Probably higher education and better marital status have a protective effect against aggravation of depression. Similar results were reported in another study [23]. We also analyzed the impact of gender, education, and marital status on the scores of PDQ-D5. We investigated the level of education based on the suggestion that it could affect cognitive performance. We hypothesized that more educated elderly could be more sensitive to disturbance in cognition and have higher scores on PDQ-D5. That hypothesis was rejected. Gender and education did not influence the scores of PDQ-D5. The only socio-demographic factor that impacted the scores of PDQ-D5 was marital status. In our sample, the scores of unmarried depressed elderly were

significantly higher than the scores of married. Obviously, there is a relation between subjective perception of cognitive dysfunction and chronic lack of family support. Being single for a long time is a predictor of severe depressive episodes and worse perceived cognitive functioning as a state marker of depression. Unmarried depressed elderly cannot rely on a family member, and therefore the perception of disturbed functioning leads to worse depression severity. Similar results are seen in the literature [24].

In our sample, the perceived deficit of cognitive functioning was mainly impaired in severe depression. All severity groups significantly differed by each other. Not many studies evaluate the perceived cognitive deficits in different depression severities, even though cognitive functioning is a leading theme in depressed elderly. Most studies aim to find a correlation between SCI and future objective cognitive decline [25,26]. Discrepancies between subjective and objective cognitive decline were demonstrated in the literature. Zlatar et al. investigated 145 Hispanic elderly and reported no significant association between subjective and objective cognitive decline. They found a significant correlation between the scores of depression and subjective cognitive impairment [10]. In a clinical review of Bortolato et al., cognitive dysfunction is reported as the most frequent residual symptom of major depressive disorder. They stated that there is a strong correlation between major depressive disorder and cognitive deficit [27]. Sumiyoshi et al. also found a positive correlation between depression severity and subjective cognitive decline (assessed with PDQ) [28]. In another study, patients with severe depression also complained about worse subjective cognitive function [29]. However, Fava et al. showed a weak correlation between depression severity and perceived cognitive deficit [30]. In our study, the subjective cognitive impairment was not only in severe depression but a significant difference in all severity groups and controls was found. There is no other study to our knowledge that compares the perceived cognitive dysfunction in different depression severities in depressed elderly. We think that the scores of PDQ-D5 can assess the present clinical state or the severity of depression in the elderly and are not connected with objective cognitive dysfunction.

Our results showed different impairments of subjective cognition in different cognitive domains. Executive functions

were significantly more impaired in severe depression than in all other groups. In the clinical review of Bortolato et al., such impairment was also reported [27]. Duggan et al. assessed the correlation between perceived impairment of executive functions and depression severity and found the same results as ours. No relation between mood disorders and objective impairment of executive functions was found [31].

Another cognitive domain assessed in our study was attention and concentration. A difference between all severity groups (except mild depression) and controls was seen in this domain. Patients with depression frequently complain about disturbed attention and concentration because the dysfunction of this domain negatively impacts daily functioning. It is well known that depressed individuals are focused on negative information and cannot switch to other data. So they perceive a dysfunction in this domain [32]. In an Asian study that assessed young adults, concentration was significantly impaired in severe depression than in non-depressed. Older adults had lower impairment of concentration than younger [33].

Most of the studies in the literature are focused on subjective memory complaints and depression in the elderly. Reid and MacLulich stated in their study that the determinants of subjective memory complaints are complex. They found that depression and personality traits impact the perceived cognitive functioning [34]. Actually, in literature, subjective memory complaints are associated with depression [7]. Also, a connection between subjective memory complaints and future cognitive decline is found [34]. We found no statistically significant difference in subjective memory complaints concerning the retrospective memory between the severity groups and controls. In our sample during the depression, executive functions, attention, and concentration probably impact more daily functioning than problems in retrospective memory. Depressed elderly accept not recalling a past event as a part of aging but cannot ignore problems in executing a task or disturbed concentration [35]. Therefore, we supposed that a subjective impairment in prospective memory could be detected. Prospective memory has two components – retrospective memory and executive functions [36]. The impairment of the executive component can lead to an impairment of prospective memory in depressed elderly. Our results showed such impairment, statistically significant only in

severe depression versus controls. The subjectively perceived dysfunction in prospective memory was only in severe depression because of the intact subjectively perceived retrospective memory. To perform a specific task planned in the past is extremely important for independent daily living. Similar results are found in the literature [37,38].

## CONCLUSION

Subjective cognitive impairment correlates positively with the severity of depression among the elderly. Executive functions and attention, and concentration are mainly impaired. Prospective memory was impaired only in severe depression, and retrospective memory remained intact. Subjective cognitive dysfunction, assessed with PDQ-D5, can be used to assess the present clinical severity of a depressive episode in elderly depressed patients.

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