Original article

Connection between Mental Disorders and Hypertension In Patients Treated at the Psychiatric Clinic, Clinical Hospital Centre Osijek

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Abstract

Background: The objective of this study was to assess the type and frequency of psychiatric disorders associated with hypertension and to identify sociodemographic specifics and other comorbid diseases.

Materials and Methods: This was retrospective study to establish if there was a relationship between mental disorders and hypertension in patients hospitalized at the Department of Psychiatry from January 1, 2020 to August 15, 2021. Different mental disorders were correlated with hypertension comorbidity, with the emphasis on disease duration, mental disorder characteristics, diagnostic category such as age and gender, and other comorbidities.

Results: The study included data from 800 patients hospitalized at the Department of Acute and Biological Psychiatry and the Department of Integrative Psychiatry at the Psychiatry Clinic of the University Hospital Center Osijek. All of them were treated for various mental disorders in the period from January 1, 2020 to August 15, 2021. Special emphasis was placed on the patients who had been diagnosed with a mental disorder and hypertension in order to determine how many patients treated for a mental disorder also suffer from hypertension. The research shows that 230 (28.75%) out of 800 patients suffer from both a mental disorder and hypertension.

Conclusions: The study has shown that almost one third of the respondents treated at the Psychiatry Clinic for a certain period of time suffer from hypertension. The majority of hypertensive patients were treated for recurrent depressive disorder, alcohol addiction and posttraumatic stress disorder.

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Introduction

Mental disorders, such as anxiety and depression, are risk factors for mortality among cardiac patients, but this issue has received little attention when it comes to hypertensive individuals. Research suggests that the correlation between hypertension and total and cardiovascular disease mortality is higher when combined with a common mental disorder (1). Other studies have found significant correlation between depression, anxiety, impulsive eating disorders and substance use disorders and the subsequent diagnosis of hypertension. These findings highlight the importance of early detection of mental disorders, as well as of physical health monitoring in patients with those conditions. Social phobia and alcohol abuse were more strongly associated with hypertension in males than in females. The correlation between panic disorder and hypertension was particularly apparent in those with earlier-onset hypertension (2).

Among all mental disorders, depression must be recognized as the leading risk factor for hypertension and cardiovascular incidents. For patients suffering from depression, the risk of developing hypertension depends on: a) biological b) behavioral and c) psychological factors.

Biological factors

Certain pathophysiological factors favor faster development of hypertension and other cardiovascular diseases in patients suffering from mental disorders (particularly depression and stress-related disorders):

1. Hypothalamic-pituitary-adrenal axis (HPA axis) hyperactivity, which is in the pathogenesis of the mental illness, causes an increase in blood pressure and heart rate, as well as an acceleration of the atherosclerosis process.

2. Due to dysfunction of the autonomic nervous system in patients suffering from mental disorders, the activity of their sympathetic nervous system increases, causing catecholamine hypersecretion. This leads to vasoconstriction and enables ventricular irritability. The parasympathetic tone is reduced, which lowers the level of the ventricular ectopy occurrence. In addition to reduced heart rate variability, all of the above significantly increases the risk of sudden death.

3. The state of sub-chronic inflammation caused by hyperactivity of inflammatory cytokinins CRP, IL 1 and 6 in depressed patients leads to changes in sympathetic tone and influences serotonin and platelet aggregation and fibrinolysis affected by serotonin (3, 4).

4. Hypercoagulability, triggered by serotonin and the altered function of platelets affected by serotonin. Connecting itself to the platelets via the 5-HT 2A receptors, serotonin participates in the process of platelet aggregation, accelerates vasodilation with the help of preserved endothelium and maintains the flow of blood vessels. In addition to endothelium damaged by atherosclerotic changes, released platelet serotonin causes vasoconstriction and disrupts microvascular circulation. In addition to increased platelet aggregation, a serotonin-mediated increased activation of procoagulant factors (fibrinogen, von Willebrand factor and factor VII) and the reduction of fibrinolytic activity has been detected in patients suffering from depression (5, 6).

Behavioral factors

People suffering from mental disorders are not physically active enough. They tend to have unhealthy habits: they smoke, drink alcohol, consume food excessively and therefore gain weight, which accelerates hypercholesterolemia and indirectly leads to cardiovascular disease (7).

Psychological factors

Persons prone to vascular diseases are known as type A personalities. These are persons who are hyperactive and demanding, unable to relax, and who are aggressive and ambitious. However, from the psychodynamic point of view, they are insecure, with low self-esteem and primarily depressive. If such persons are

subjected to prolonged stress, it can be manifested both directly (the impact on the cardiovascular system via autonomous nervous system) and indirectly (the impact via the hypothalamic-pituitary-adrenal axis (HPA axis)), which can eventually lead to undesirable outcomes. The symptoms of mental illness may significantly interfere with the course and outcome of a cardiac disease, as well as with the recovery period.

The purpose of this study is to analyze the incidence of comorbidity of various mental disorders and hypertension among the patients treated at the Department of Psychiatry by using the retrospective analysis of medical history. The incidence of comorbidities was compared according to different diagnostic categories of mental disorders, as well as the duration of the disease. Incidence of other comorbid somatic diseases has also been studied in those with the aforementioned comorbid mental disorders and hypertension.

Material/Patients and Methods

The research was conducted at the Department of Psychiatry at the University Hospital Center Osijek. Medical histories and medical records of the hospital information system were used as data sources. Respondents were hospitalized at the Department of Acute and Biological Psychiatry and the Department of Integrative Psychiatry at the Psychiatry Clinic. This makes a total of 800 patients with different psychiatric diagnoses, who were hospitalized in the period from January 1, 2020 to August 15, 2021. The following factors were analyzed: the patients' age and gender, all psychiatric diagnoses for which they were treated, treatment duration and comorbidities. In our study, the emphasis was put on the comorbidity of mental disorders and hypertension, but other somatic disease comorbidities were also evaluated. Specific characteristics of the analyzed patient category were observed and recorded using the hospital IT system. The criterion for patient selection was the time period in which they were hospitalized at the Department of Psychiatry (from January 1, 2020 to August 15, 2021). The age and gender of all the patients, as well as their diagnostic categories, disease duration and comorbidities, were all recorded.

Statistical analysis

Data collected by reviewing specialist findings were processed using descriptive statistical methods. Categorical data are presented in absolute and relative frequencies. Numerical data are described by the arithmetic mean and standard deviation in the case of distributions following the normal distribution, and in other cases by the median and limits of the interquartile range. Differences or correlations of categorical variables were tested by $\chi 2$ test. A specific statistical program SPSS was used for statistical analysis. Significance level was set at $p<0.05$.

Results:

Special emphasis was placed on the patients who had been diagnosed with a mental disorder and hypertension in order to determine how many patients treated for a mental disorder also suffer from hypertension. The results of present study showed that 230 (28.75%) out of 800 patients suffer from both a mental disorder and hypertension. 1.3% of patients who suffered from both mental disorder and hypertension were between 20 and 29 years old; 2.6% ages 30 -39; 10% were 40 - 49 years old; 35.2% of patients were 50 – 59 years old; 36% were 60 – 69 years old; 12.6% were 70 – 79 years ol, and 2.1% of patients were over 80 years old. Other age categories were not recorded. The majority of patients with hypertension comorbidity were between the ages of 60 and 69, whereas the minority were between the ages of 20 and 29. 51.73% of patients with mental disorders and hypertension were women, and 48.26% were men. There is no statistical significance between the sexes.

Furthermore, the focus of the study was to determine which mental disorders the patients with hypertension comorbidity suffered from (Table 1). The highest percentage (30% (N=230) of the patients) suffered from recurrent depressive

disorder. 17.2% of psychiatric patients with hypertension were treated for alcohol addiction and 16% were treated for posttraumatic stress disorder. There were 14.3% of patients treated for recurrent depressive disorder with psychotic symptoms, and 11.7% of them were treated for schizophrenia. 9.5% of patients with hypertension were treated for psychoorganic symptoms and personality disorders, 7.3% of them were treated for bipolar affective disorder, 6.9% for first depressive episode and 4.7% for schizoaffective disorder. 3.4% of patients with hypertension were treated for mixed anxiety and depressive disorder, 3% for generalized anxiety disorder (GAD), 2.6% for inorganic psychotic disorder, 2.2% for adjustment disorder, 1.7% for delusional disorder and dementia. Finally, the smallest number of patients suffering from hypertension were treated for first psychotic reaction (1.3%).

Table 1. All psychiatric diagnoses of the patients with hypertension

ICD-10 Diagnosis	Description	n	%
F01-F09	**Mental disorders due to known physiological conditions**		
F03	Unspecified dementia	4	1.7
F06	Other mental disorders due to known physiological condition	22	9.5
F10-F19	**Mental and behavioral disorders due to psychoactive substance use**		
F10	Alcohol related disorders	41	17.8
F20-F29	**Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders**		
F20	Schizophrenia	27	11.7
F22	Delusional disorders	4	1.7
F23	Brief psychotic disorder	3	1.3
F25	Schizoaffective disorders	11	4.7
F28, F29	Other or unspecified psychotic disorder not due to a substance or known physiological condition	6	2.6
F30-F39	**Mood [affective] disorders**		
F31	Bipolar disorder	17	7.3
F32	Depressive episode	16	6.9
F33	Major depressive disorder, recurrent	71	30
F33.3	Major depressive disorder, recurrent, severe with psychotic symptoms	33	14.3
F40-F48	**Anxiety, dissociative, stress-related, somatoform and other nonpsychotic mental disorders**		
F41.1	Generalized anxiety disorder	7	3
F41.2	Mixed anxiety and depressive disorder	8	3.4
F43.1	Post-traumatic stress disorder (PTSD)	37	16
F43.2	Adjustment disorders	5	2.2
F60-F69	**Disorders of adult personality and behavior**		
F60	Specific personality disorders	22	9.5

Depressive disorder and other mental disorders comorbidity were studied in more detail than any other mental disorders monitored and compared to hypertension comorbidity. The study showed that 9.5% of all the respondents had depressive disorder and posttraumatic stress disorder in comorbidity with hypertension, 6% of them suffered from depressive disorder and alcohol addiction, while 1.7% of depressed patients suffered from organic psychosyndrome and hypertension. The study also focused on the treatment period and the criterion included the long-term treatment of the mental disorder. The study showed that 81% of patients suffering from a mental disorder and hypertension had a chronic mental disease.

Other somatic comorbidities, particularly the most common somatic diseases, were monitored in addition to the mental disorder and hypertension comorbidities. 28.2% of patients suffering from various mental disorders and hypertension also suffered from chronic gastritis, 26.5% of them had diabetes mellitus, 1.8% had hyperlipidemia, and 8.7% had hypothyroidism.

Of the total number of the respondents with mental disorders and comorbid hypertension, 18.2% suffered only from hypertension and had no other physical disorders, whereas 81.8% also suffered from other physical illnesses (Table 2)..

Table 2. The most common physical comorbidities in patients with hypertension

ICD-10 Diagnosis	Description	n	%
E11	Type 2 diabetes mellitus	61	26.5
E78	Disorders of lipoprotein metabolism and other lipidemias	41	17.8
K29	Gastritis and duodenitis	65	28.2
E03	Other hypothyroidism	20	8.7

Discussion

The aim of the research was to establish the frequency of hypertension occurring in association with various mental disorders among all patients treated throughout this time period. According to the findings, 28.75% of the hospitalized patients had hypertension, which is consistent with the findings of other international studies. For example, in the study by Rantanen et al., the overall prevalence of depressive symptoms among respondents with hypertension was 22.8% (8). Furthermore, Li et al. found an even higher depression prevalence (29.8%), having conducted a meta-analysis of 10,194 hypertensive respondents in 27 studies using self-assessment scales (9). Predominantly conducted were screening studies of patients with hypertension and the level of their association with mood disorders.

In this study, the patients' age and gender were monitored separately among the respondents suffering from a mental disorder and hypertension. The results obtained indicate that the majority of patients (36%) were between the ages of 60 and 69, with the next most prevalent age group being between the ages of 50 and 59 (35.2%). Patients aged 20 to 29 had the lowest hypertension suffering ratio.

The age groups 70 to 79 and 30 to 39 had a comparable ratio, 12.6% and 10% respectively. The age groups 30 to 39 (2.6%) and above 80 (2.1%) had about the same percentage. Patients under the age of 20 were not represented.

There was no significant difference in terms of gender distinction: 51.7% were women while 48.3% were men. According to numerous literary sources, there is a difference in the affective disorder occurrence in terms of gender distinction. Depression occurs almost twice as often (2:1) in women than in men. The depression

incidence is estimated to be around 11% in men and 19% in women. The cause for that can be found in hormonal variations, primarily in serotonin, which affect patients' metabolism. An even greater difference in disorder incidence can be seen in anxiety disorders, with the frequency of anxiety disorders being more frequent in women than in men with a ratio of 3:2, and, according to some studies, of 2:1. As far as bipolar affective disorder and schizophrenia are concerned, it is estimated that the frequency is approximately equal (about 1%) (10). Since the predominant diagnostic category of this study was depressive disorder, the obtained results of female predominance were expected. However, in our study a smaller gender difference was observed, which can be attributed to the simultaneous analysis of all the represented diagnostic psychiatric categories. In one study, the most powerful predictor of depression and hypertension comorbidity was the female gender, which was followed by alcohol abuse and obesity. It seems that non-smokers and the moderately physically active people alleviate depression symptoms when compared with the people who are rarely physically active (8).

We were particularly interested in diagnostic categories of mental diseases that are in comorbidity with hypertension. Of the seventeen monitored diagnostic categories, the highest percentage of psychiatric patients were treated for recurrent depressive disorder (30%), which is also confirmed by other studies. The results of international meta-analysis suggest that when compared with the general population of the same age and gender, depressive patients have a 30% to 50% higher risk of developing cardiovascular disease and hypertension (11, 12). 2 out of 5 patients with coronary artery disease suffer from a clinically significant depressive disorder (12).

The mortality rate from cardiovascular diseases is 50% higher among depressive patients when compared to the general population (13). Depressive disorder doubles the risk of occurrence of major cardiovascular incidents (such as death caused by coronary heart disease, coronary incidence or myocardial reinfarction, heart failure, myocardial revascularization, fatal and nonfatal stroke) within a two-year-period after acute myocardial infarction (14). The prevalence of depressive disorder is three times higher in patients who have survived acute myocardial infarction in relation to the general population (15). Depressed patients have a 35% higher risk of having a stroke than the general population of the same age and gender (16).

Based on the data from a large population register of Sweden, Sandström et al. have shown that individuals with hypertension are more likely to suffer from depression than individuals who do not have hypertension (17). According to the US National Epidemiological Study of Monitoring Health and Nutrition, the comorbidity of hypertension with depression symptoms is associated with a 15% higher relative mortality risk than hypertension without depression symptoms, even after adjusting for lifestyle factors and comorbid diseases (18).

Higher level of psychological stress in patients treated for hypertension may partly be explained by the hypertension diagnosis (19, 20). The awareness of hypertension may have a labeling effect that causes mental distress, as suggested by Hamer et al. (19) On the other hand, Michal et al suggested that it could be a consequence of depressed persons' increased use of health care (20).

The second most common diagnostic category in our study was alcohol addiction (17.8%), even though there is a slight variation in terms of the frequency of our study's most common disorder. According to the data obtained in the study, we may conclude that the recurrent depressive disorder is mainly associated with hypertension, while the next most frequent disorder is 1.68 times less frequent. Posttraumatic stress disorder was represented in hypertension comorbidity with 16%. The fourth most frequent diagnostic category was recurrent depressive disorder with psychotic symptoms (14.3%). Schizophrenia was the fifth most frequent type of mental disorder (11.7%), followed by specific personality disorder (9.5%).

The least frequent diagnostic category was acute psychotic disorder, but because it is more

common in younger patients, this may also explain why it has the lowest prevalence of comorbidity with hypertension.

6.9% of patients suffering from illnesses with hypertension comorbidity were treated for the first depressive episode. We were especially interested in not only the duration of mental disorder and duration of treatment, but also in how the afore-mentioned parameters can affect the occurrence of hypertension and other somatic comorbidities. As regards the duration of the mental disorder in hypertensive patients, 81% of the respondents were receiving long-term psychiatric treatment. Their mental illness had lasted for several years, and the majority of them suffered from recurrent depressive disorder. In terms of frequency, alcohol addiction was the second most frequent, followed by post-traumatic stress disorder, both of which were categorized as chronic illnesses. We may conclude that chronic mental illnesses may be a risk factor for the incidence of somatic diseases such as hypertension.

Because recurrent depressive disorder was identified as the most prevalent chronic illness in patients who also suffered from hypertension, the connections with other mental disorders that occurred in comorbidity with recurrent depressive disorder were additionally analyzed (Table 2). The majority of patients (9.5%) suffered from both recurrent depressive disorder and chronic post-traumatic stress disorder. 6% of the patients had a comorbidity of recurrent depressive disorder and alcohol addiction, while 1.7% of patients with recurrent depressive disorder developed psycho-organic symptoms. All of the patients with two chronic mental disorders suffered from hypertension. 81% of patients were in a long-term psychiatric treatment.

The data obtained can be linked to the neuroendocrine theories, which are based on the fact that the hypothalamic-pituitary-adrenal axis (HPA axis) is dysregulated in 50% of depressed patients. Due to the absence of the negative feedback loop, the HPA axis is hyperactive, resulting in an increase in serum cortisol levels (in the range of 20% to 80%), which, in the biological sense, indicates a continuous state of chronic stress. Patients with HPA axis hyperactivity, on the other hand, are more likely to suffer from depression with psychotic symptoms or another mental illness, especially stress-related mental disorders (e.g., posttraumatic stress disorder). Thyroid disorders have also been reported in patients with depression (according to some studies, in about 25% of patients) (21, 22).

Only 18.2% of patients treated at the Department of Psychiatry had no physical illnesses other than hypertension, which is a modest proportion when compared to 81.8% of those who had multiple concurrent physical diseases. Given the large proportion of psychiatric patients with multiple physical comorbidities, the categories of the represented physical diseases were studied separately. The most prevalent diseases were also analyzed separately in terms of their incidence. Along with hypertension, chronic gastritis was the most common (28.2%). It can be concluded that almost one third of psychiatric patients suffered from both hypertension and chronic gastritis. The disease with an approximate incidence rate relative to chronic gastritis was diabetes mellitus (26.5%). Furthermore, a high percentage of psychiatric patients suffered from metabolic lipid disorders (17.8%). Finally, the incidence of hypothyroidism was also studied, and it was found that 8.7% of psychiatric patients with hypertension also suffered from this disease. It is possible to conclude that psychiatric patients belong to a vulnerable group with a high risk of developing chronic physical diseases with a progressive course.

According to numerous studies, psychiatric patients are at a higher risk of morbidity and mortality due to physical disorders (23-25). Serious and permanent mental disorders can shorten a patient's life by up to four years when compared to persons who do not have mental disorders.

A representative epidemiological study from the 2001-2003 U.S. National Comorbidity Survey (NCS-R) found that comorbidity between physical and mental diseases was the rule, not

the exception. (26, 27) More than 68% of adults with a mental disorder reported having at least one physical disorder, and 29% of those with a physical disorder had a comorbid mental disorder. Elderly patients and those diagnosed with organic psychosyndromes have been shown to be at the highest risk of comorbid physical illness. (28) In conclusion, a mental disorder is a risk factor for physical disorder and vice versa. In particular, physical illness is one of the strongest risk factors for depression and vice versa (29, 30). An epidemiological study found that the likelihood of being diagnosed with depressive disorder increased with each additional comorbid chronic somatic disease among its respondents (31). According to other studies, depression is comorbid with 26 disease categories and is most prevalent in combination with gastrointestinal disease, stroke, musculoskeletal disease, Parkinson's disease, respiratory disease and obesity (32). The study by Andres et al. (33) analyzes the association between post-infarction depression in patients with recurrence of acute myocardial infarction, where psychiatric disorders affected the risk of infarction recurrence in the same way that cigarettes, diabetes, and obesity did. Several authors reported that specialists could not recognize comorbid somatic diseases in nearly half of all the cases. (34, 35) In some cases, physical diseases lead to psychiatric disorders or they deteriorate the existing symptoms. In addition to mental disorder, the harmful effects of medications or some other treatments can result in serious physical pathology (36).

Conclusion

The study has shown that almost one third (28.75%) of the respondents who were treated at the Department of Psychiatry for a certain period of time suffered from hypertension.

The majority of patients suffering from hypertension were treated for recurrent depressive disorder, alcohol addiction and posttraumatic stress disorder. The least represented diagnostic category was acute psychotic disorder.

More than 80% of psychiatric patients with hypertension were in a long-term psychiatric treatment and that fact can be associated with a number of other physical comorbidities they suffered from.

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