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Original Scientific Paper

THE INCIDENCE OF COMORBID MENTAL AND PHYSICAL CONDITIONS IN PATIENTS WITH POST-TRAUMATIC STRESS DISORDER

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SUMMARY – There is a small body of research about mental and physical comorbidity in post-traumatic stress disorder (PTSD) patients despite the fact that some psychiatric disorders and physical conditions are commonly comorbid with PTSD. In this study, we researched the relationship between PTSD and its mental and physical comorbidities by comparing the number of patient hospitalizations across two ten-year periods. Our sample consisted of 2761 patients with warfare PTSD hospitalized during the 20-year period (1999-2018). The results confirmed a higher number of hospitalizations in the 2009-2018 period than in the 1999-2008 period for the group of PTSD patients with both mental and physical comorbidity. Furthermore, no significant difference was found in the number of hospitalizations between the two ten-year periods for the group of PTSD patients with mental comorbidity. We argued that both mental and physical comorbidities along with PTSD are needed to induce a significantly higher level of distress in patients, resulting in a higher number of hospitalizations after a longer period of time. Patients with the most severe conditions and comorbidity have a greater need to seek help from mental health professionals as their mental and physical state deteriorates to a higher degree when not in the treatment of any kind.

Key words: *Post-traumatic stress disorder; Metabolic syndrome; Comorbidity; Hospitalization; Veterans*

Introduction

Post-traumatic stress disorder (PTSD) is one of the most researched mental health disorders today. In this study, we tried to understand the relationship between PTSD and its mental and physical comorbidities in relation to the number of patient hospitalizations across two ten-year periods. Britvić *et al*. performed a study on a sample of 1558 participants. They divided most of them into two groups: experimental group consisted of 501 war veterans with PTSD, whereas 825 participants with no war experience served as a control group. The results showed that war veterans had significantly more somatic diseases (including cardiovascular, dermatologic, musculoskeletal, respiratory diseases, metabolic diseases) than the control group, who did not have war trauma and were not diagnosed with PTSD. Predictors of somatic diseases used in the war veteran group were exposure to war trauma, age, duration of exposure to war trauma, and physical wounds. Cardiovascular, musculoskeletal, and malignant diseases had a higher incidence in older participants and those wounded in war or with a longer duration of trauma exposure. Longer war exposure also predicted a higher risk of heart arrhythmia and comorbidity with psychiatric

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disorders[1]. A study on 156 war veterans in primary healthcare showed that the group of participants who had a higher need for primary healthcare utilization had a higher chance of fulfilling the criteria for PTSD, which clearly shows a higher primary healthcare need in patients with PTSD symptoms and the association of PTSD with physical health[2]. In one of their studies, David *et al*. compared physical comorbidity between two groups of war veterans. The first group of veterans had been diagnosed with PTSD, while the second group consisted of veterans prone to alcohol abuse but lacking a PTSD diagnosis. Data showed that veterans diagnosed with PTSD had significantly more problems with hypertension, hyperlipidemia and higher body mass index (BMI) with a greater likelihood of developing diabetes, cardiovascular diseases (CVD), and osteoarthritis when compared to the other group who had a greater chance of developing liver and pulmonary diseases[3]. Moreover, McLeay *et al*. compared the prevalence of comorbid physical conditions between two groups of Australian Vietnam War veterans; a group diagnosed with PTSD and a group that was exposed to war trauma but not diagnosed with PTSD. Results showed a higher incidence of physical morbidity in the PTSD group. In contrast, comorbidity diagnoses were related to gastrointestinal, cardiovascular, and respiratory systems, higher BMI, sleep disorders, risky behaviors, alcohol abuse, and smoking[4]. Evidence from a study on PTSD prevalence and comorbidity among 377 hospitalized adolescents revealed a higher rate of comorbidity with major depression disorder and disruptive behavior disorders in the group of adolescents diagnosed with PTSD compared to the adolescents without PTSD[5]. Ryder *et al*. summarize that recent research has considerably advanced the field of PTSD and physical health by including larger and more diverse samples. They also emphasize the importance of using objective measures in order to establish that patients with PTSD are more likely to develop chronic diseases and report adverse physical health symptoms and conditions. A consistent association between PTSD and several other disorders exists, including cardiovascular and metabolic disease, although many conditions still have limited or conflicting evidence[6]. Long-term metabolic syndrome is a significant factor in cardiovascular risk with the presence of resistant hypertension, high-grade renal failure, and nephrotic proteinuria with its consequences. Significant morphological changes require a multidisciplinary approach with necessary changes in lifestyle habits, i.e., smoking cessation, weight loss, restriction of salt and fat intake, moderate exercise, regulation of blood sugar, urate and blood pressure, and necessary invasive interventions[7]. In their study, Hoerster *et al*. suggest that veterans with higher PTSD symptoms and lower depressive symptoms may maintain behavioral patterns that could be capitalized upon to improve health (healthy eating and activity patterns). Furthermore, comorbid depressive symptoms in the context of PTSD symptoms may contribute to diabetes and CVD through their negative impact on health behaviors[8]. Strauss *et al*. investigated the effects of PTSD on the quality of life and healthcare utilization in the population of war veterans who primarily suffered from either schizophrenia or schizoaffective disorder. Out of 165 participants, 41% had PTSD comorbidity. This study showed that patients with PTSD as a comorbid disorder had a higher healthcare utilization rate in specialized clinics for physical conditions, whereas no difference was found in healthcare utilization at mental health clinics[9]. In another study related to PTSD, Chung *et al*. report on chronic idiopathic urticaria and its relation to PTSD symptoms arisen from previous traumatic experiences. This finding gives an example of how PTSD may elevate the risk of having multiple idiopathic physical symptoms[10]. There are more studies on correlations between psychiatric disorders and physical conditions. For example, Chwastiak *et al*. explored correlations between psychiatric disorders and risky behaviors including smoking, physical inactivity and obesity, and their repercussion on cardiovascular morbidity and mortality. Data analysis of a sample of 501,161 war veterans with different psychiatric disorders indicated a higher proneness to risky behavior in veterans with schizophrenia, PTSD, and bipolar affective disorder, which implicates a higher cardiovascular risk that may result in a higher incidence of CVD[11]. A meta-analysis performed by Bartoli *et al*. compared many studies on the presence of metabolic syndrome in people who did or did not suffer from PTSD. The authors confirmed the hypothesis that a person who suffered from PTSD had a significantly higher risk of comorbidity with other diseases[12]. A study showed there was a greater incidence of suicide among depressive patients with the diagnosis of metabolic syndrome. The diagnosis was more frequently established in depressive women, while an increased intake of carbohydrates represented a significant feature of both depression and metabolic

syndrome[13]. In their study of older adults exposed to missile attacks, Shrira and Hoffman report that even when PTSD was accompanied by depression, constituting a high level of stress, a young subjective age was a potent buffer. Thus, a young subjective age was associated with a mitigated-to-null-effect of the comorbid stressor on physical health indices. Following the latter, it could be argued that having a younger subjective age reflects an individual with higher psychological resources, for example, a higher sense of well-being, vitality, life satisfaction, and meaning in life. Thus, an individual could have more resources to develop and use different coping mechanisms and manage reccurring PTSD symptoms[14]. Flory and Yehuda report that approximately half of the people with PTSD also suffered from major depressive disorder (MDD). They examined evidence for two possible explanations for this comorbidity: first, that the comorbidity reflects overlapping symptoms in the two disorders, and second, that the co-occurrence of PTSD and MDD is not an artifact, but represents a trauma-related phenotype, possibly a subtype of PTSD[15].

In this study, we tried to answer the question whether PTSD patients with both physical and mental comorbidities had a higher rate of hospitalizations in the last ten-year period (2009-2018), and if so, possibly provide some plausible explanations. The aim of this study was to obtain and analyze available data from medical records of PTSD patients over the last 20 years and understand the possible difference in the number of hospitalizations between different groups of PTSD patients based on comorbidity in two ten-year periods. We hypothesized that the number of hospitalizations in the 2009-2018 period was higher than in the 1999-2008 period for the group of PTSD patients with physical comorbidity. Furthermore, we hypothesized that the number of hospitalizations in the 2009-2018 period was higher than in the 1999-2008 period for the group of PTSD patients with both mental and physical comorbidities. Finally, we hypothesized that there was no significant difference in the number of hospitalizations between the two ten-year periods for the group of PTSD patients with mental comorbidity.

Materials and Methods

In this retrospective study, the sample consisted of 2761 PTSD patients from Croatia hospitalized during the 20-year period (1999-2018) at the Department of Psychiatry, Rijeka University Hospital Center, Rijeka, Croatia. All patients were diagnosed by mental health professionals following the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria. PTSD was their primary diagnosis, and the main reason for hospitalization was worsening of their PTSD symptoms. Comorbid physical conditions along with PTSD were diagnosed in other departments or hospital outpatient clinics of the Rijeka University Hospital Center, depending on the condition. Patient medical records were analyzed and all available data were collected. As the 1999 medical records contained less data than recent ones, statistical analysis was conducted only on the data available for all 20 years. All patients had warfare-related PTSD due to traumatic event exposure during the 1991-1995 Croatian War of Independence.

The data collected were analyzed using IBM SPSS Statistics for Windows, Version 21.0. Prior to the analysis, we categorized the number of patient hospitalizations into four different groups according to patient medical diagnoses, as follows: patients with PTSD, patients with PTSD and physical comorbidity, patients with PTSD and mental comorbidity, and patients with PTSD and both physical and mental comorbidities. The Kolmogorov-Smirnov goodness-of-fit test was used to test for the normality of distribution. Statistical methods included five independent two-sample t-tests used for assessing the mean difference in the number of hospitalized patients for each group and the sample between the two ten-year periods (1999-2008 and 2009-2018).

Ethics

All procedures performed in the study were in accordance with the institutional and/or national ethical standards and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Rijeka University Hospital Center Ethics Committee. This type of data collection and analysis required no formal consent to participate because data were collected from the hospital medical records.

Results

The basic demographic data on the sample and four groups in the study are shown in Table 1. Furthermore, Table 2 includes descriptive data showing means

and standard deviations (SD) of the number of hospitalizations for each diagnosis group between the two ten-year periods. Results showed a statistically significant difference in the number of hospitalizations of PTSD patients with comorbid mental and physical conditions between the two hospitalization periods (t=4.22, df=10.13, p<0.01). In the group of patients with PTSD and comorbid mental and physical conditions, the number of hospitalizations was significantly lower in the 1999-2008 period (M (1999-2008)=13.00, SD (1999-2008)=7.70) than in the 2009-2018 period (M (2009-2018)=55.20, SD (2009-2018)=30.70). Data analysis showed a significant difference in the number of hospitalizations of all patients between the two hospitalization periods (t=2.67, df=14.41, p<0.05). In the 1999-2008 period, the number of hospitalizations of all patients was significantly lower (M (1999-2008)=112.60, SD (1999-2008)=30.15) than the number of hospitalizations in the 2009-2018 period (M (2009-2018)=163.50, SD (2009-2018)=52.13).

Table 1. Descriptive and basic demographic data on the sample and groups according to the number of hospitalizations in the 1999-2018 period

	Sample (N=2761)	Diagnosis group			
		PTSD (N=392)	PTSD, MC (N=1591)	PTSD, PC (N=96)	PTSD, PC, MC (N=682)
Sex: M:F (M %)	2492:269 (90.3%)	364:28 (92.9%)	1421:170 (89.3%)	87:9 (90.6%)	620:62 (90.9%)
Age (years) Mean ± SD, Range	46.04±8.69 16-80	42.95±7.65 18-64	45.70±8.67 18-80	42.48±10.05 16-59	49.12±8.11 18-73

PTSD = post-traumatic stress disorder; PC = physical condition; MC = mental condition; M = male; F = female; SD = standard deviation

Table 2. Number of hospitalizations for each diagnosis group in two hospitalization periods

Diagnosis	Hospitalization period	
	1999-2008 (M ± SD)	2009-2018 (M ± SD)
PTSD	23.60±12.24	15.60±10.01
PTSD, MC	71.70±21.80	87.40±24.37
PTSD, PC	4.30±2.11	5.30±3.13
PTSD, MC, PC	13.00±7.70	55.20±30.70
Sample	112.60±30.15	163.50±52.13

M = mean; SD = standard deviation; PTSD = post-traumatic stress disorder; PC = physical condition; MC = mental condition

Table 3. Difference in the number of hospitalizations between two hospitalization periods for different diagnosis groups of patients

Diagnosis	df	t	p
PTSD	18	1.60	0.13
PTSD, MC	18	1.52	0.15
PTSD, PC	18	0.84	0.41
PTSD, MC, PC	**10.13**	**4.22**	**<0.01**
Sample	**14.41**	**2.67**	**<0.05**

PTSD = post-traumatic stress disorder; PC = physical condition; MC = mental condition; df = degree of freedom; t = t-test value; p = p-value of t-test

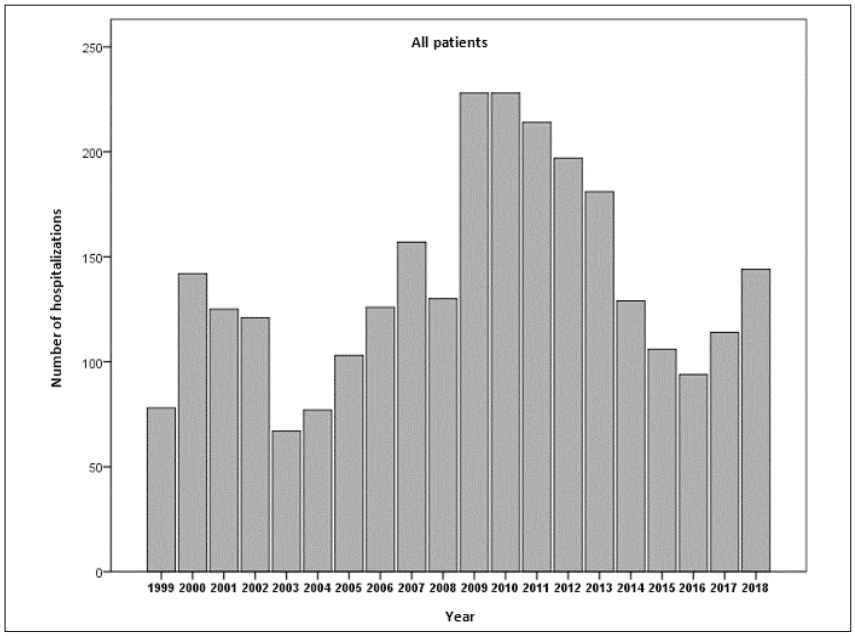

Fig. 1. Number of hospitalizations of all patients according to years (1999–2018).

Table 4. Most common mental and physical conditions comorbid with PTSD in study sample

	Mental conditions comorbid with PTSD												Physical conditions comorbid with PTSD	
Dx	F10.0	F10.1	F10.2	F10.3	F32.1	F32.2	F32.3	F33.1	F33.2	F33.3	F54	F61	E11	I10
Number of Dx	64	187	402	24	114	131	21	64	169	39	664	472	85	234
	677				266			272			664	472		
Total	667				538						664	472	319	

PTSD = post-traumatic stress disorder; PC = physical condition; MC = mental condition; Dx = diagnosis;
F10 Mental and behavioral disorders due to use of alcohol:
- 0.0 Acute intoxication
- 0.1 Harmful use
- 0.2 Dependence syndrome
- 0.3 Withdrawal state

F32 Depressive episode:
- 0.1 Moderate depressive episode
- 0.2 Severe depressive episode without psychotic symptoms
- 0.3 Severe depressive episode with psychotic symptoms

F33 Recurrent depressive disorder:
- 0.1 Recurrent depressive disorder, current episode moderate
- 0.2 Recurrent depressive disorder, current episode severe without psychotic symptoms
- 0.3 Recurrent depressive disorder, current episode severe with psychotic symptoms

F54 Psychological and behavioral factors associated with disorders or diseases classified elsewhere
F61 Mixed and other personality disorders
E11 Non-insulin-dependent diabetes mellitus
I10 Essential (primary) hypertension

There was no significant difference in the number of hospitalizations between the two time periods for the groups of patients with PTSD only, PTSD with comorbid mental conditions, and PTSD with comorbid physical conditions. The reported results are shown in Table 3. Figure 1 illustrates the distribution of the number of hospitalizations of all patients by years. The most common comorbid physical and mental conditions along with PTSD in our sample were demonstrated by additional data analysis. Data on comorbid mental conditions and comorbid physical conditions are shown in Table 4.

Discussion

Our results confirmed the second hypothesis, according to which there was a higher number of hospitalizations in the 2009-2018 period among patients with PTSD and comorbid mental and physical conditions in comparison to other groups of patients. Weiss *et al*. conclude that PTSD could predict metabolic syndrome diagnosis, which is related to a higher risk of cardiovascular and cerebrovascular diseases and diabetes, which coincides with our findings[16]. This research showed that diabetes and hypertension were the most common comorbid physical conditions in patients with PTSD. This evidence can lead to similar conclusions about PTSD comorbidity with other conditions, as shown by other authors in their work on this topic[17,18]. Another promising finding is that the most common mental disorder comorbid with PTSD was depression, as also found in other studies[19,20]. It is also known that some other psychiatric diseases and disorders are common PTSD comorbidities[21]. Pietrzak *et al*. analyzed the prevalence and psychiatric comorbidity of partial and full PTSD on a representative sample of USA citizens. They concluded that PTSD could be related to a higher rate of mood disorders, anxiety, and substance abuse, which was also shown in our sample because the results demonstrated that substance abuse was the one following immediately the most common PTSD comorbidity (depression or other mood disorders)[22]. There is a small body of research about mental and physical comorbidities in PTSD patients. For example, Sareen *et al*. showed that PTSD could be related to severe physical conditions, suicidal tendencies, lower quality of life, and short- and long-term disability, which could be in some way related to our findings[23]. However, we conclude that further research is needed before giving definitive answers on how PTSD is related to the occurrence of comorbid diseases and disorders.

Our first hypothesis was not confirmed, and no significant difference was found in the number of hospitalizations between the two time periods for the group of PTSD patients with a comorbid physical condition. This result could in part be explained by the fact that having only physical comorbidity is insufficient to produce significantly higher distress in patients to a level that a higher number of hospitalizations is needed. Another finding that could shed some light on this issue is the result that there was no significant difference in the number of hospitalizations between the two ten-year periods for the group of PTSD patients with mental condition comorbidity, which confirms the third hypothesis. We could argue that both mental and physical comorbidities along with PTSD are needed to produce a significantly higher level of distress in patients, resulting in a higher number of hospitalizations after a longer period of time.

However, our findings support the notion that there was a higher number of hospitalizations in the 2009-2018 period, which may have been caused by many different factors. One possible explanation is that patients with the most severe conditions and comorbidities have a higher need to seek help from mental health professionals as their mental and physical state deteriorates to a higher degree when not receiving treatment of any kind or when not following any of the mental health professional guidelines given during previous hospitalization. There is a possibility that patients with 'milder' conditions can cope with their conditions (for example, self-medicate or use other forms of self-helping mechanisms) for a longer period of time without the help of mental health professionals. A higher need to seek help can occur once their problems become unbearable and symptoms create distress or a higher form of functional impairment (e.g., social, occupational). Our sample included only PTSD patients with warfare trauma, so this explanation presumes that all of the patients had wartime PTSD in which trauma occurred before 1999. This could imply that after a longer period of time, as their mental and physical state deteriorated, we have a higher number of first-time hospitalization or re-hospitalization of patients with PTSD and both mental and physical comorbidities. Furthermore, this implies that patients with PTSD and both mental and physical comorbidities have a lower ability to successfully cope with their conditions at long term and that after they deplete

their coping resources, they seek help in the form of hospitalization. More research is needed to support the given explanation. One way of getting more clear results would be testing this hypothesis by differentiating the number of first-time hospitalizations and number of re-hospitalizations. It could be interesting to research the use of self-help and different coping mechanisms in PTSD patients and how they are related to the number of hospitalizations across different periods of time. Also, when our sample was divided into different diagnosis groups, it showed differences in the group sample size, which should be addressed and equalized in the next body of future research. Another possible explanation of the given results is that there was a second wave of Croatian veteran disability benefit approval in 2013. This 'event' could have been a trigger that motivated a higher number of war veterans to start a formal procedure to become eligible for veteran disability benefits. The procedure for eligibility includes a period of hospitalization and mental health professional assessment, and therefore the result could be higher than the average number of assessments and hospitalizations of PTSD patients during that period of time.

Conclusion

To conclude, we found a significantly higher number of hospitalizations in PTSD patients with both mental and physical comorbidities, showing a higher need for patient follow-ups and continuous long-term treatment. Our results also revealed an upward tendency in the number of hospitalizations of PTSD patients with mental condition comorbidity, which could imply that this group of patients is more vulnerable to exacerbation of symptoms than patients with PTSD only, as shown elsewhere[24,25]. On the other hand, patients with PTSD only showed a downward tendency in the number of hospitalizations, which could go hand in hand with the explanation that the group of patients without mental or physical comorbidities could have a higher capacity for therapy, treatment, and faster recovery time and rate.

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Sažetak

POSTTRAUMATSKI STRESNI POREMEĆAJ UZ KOMORBIDNE TJELESNE I PSIHIČKE BOLESTI

M. Vučić Peitl, D. Palaić, F. Habibović i *B. Šešo*

Postoji relativno manji broj istraživanja o mentalnim i tjelesnim subolestima kod bolesnika s posttraumatskim stresnim poremećajem (PTSP) unatoč činjenici da su određeni psihijatrijski poremećaji i tjelesna stanja učestali komorbiditeti PTSP-a. U ovom istraživanju ispitan je odnos između PTSP-a i njegovih mentalnih i fizičkih subolesti usporedbom broja hospitalizacija bolesnika u dva desetogodišnja razdoblja. Uzorak je činio 2761 bolesnik s ratnim PTSP-om koji su bili hospitalizirani tijekom 20-godišnjeg razdoblja (1999.-2018.). Rezultati su potvrdili statistički značajno veći broj hospitalizacija u razdoblju 2009.-2018. nego u razdoblju 1999.-2008. kod skupine bolesnika koji boluju od PTSP-a istodobno s mentalnim i tjelesnim subolestima. Nadalje, nije nađena značajna razlika u broju hospitalizacija između dva desetogodišnja razdoblja za skupinu bolesnika s PTSP-om i mentalnim subolestima. Moguće je objašnjenje da su i psihičke i tjelesne subolesti s PTSP-om potrebne za stvaranje značajno veće razine tegoba kod bolesnika, što rezultira većim brojem hospitalizacija nakon duljeg razdoblja. Također, moguće je da bolesnici s najtežim stanjima i subolestima imaju veću potrebu tražiti pomoć stručnjaka za mentalno zdravlje, jer se njihovo mentalno i tjelesno stanje u većoj mjeri stalno pogoršava kada ne primaju neki oblik liječenja.

Ključne riječi: *Post-traumatski stresni poremećaj; Metabolički sindrom; Subolesti; Bolničko liječenje; Veterani*