

## THE PREVALENCE OF METABOLIC SYNDROME IN PATIENT WITH POSTTRAUMATIC STRESS DISORDER

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### SUMMARY

**Background:** Although the connection between body and soul is written in the Bible, research papers haven't given much attention to it until the past few decades. Recently, both here and abroad, there have been more studies that investigate the prevalence of various somatic disorders in psychiatric patients, including metabolic syndrome.

**Objective:** The objective of this study was to establish the prevalence of metabolic syndrome and its components in patients with posttraumatic stress disorder (PTSD).

**Subjects and methods:** Metabolic syndrome and its components were investigated in 60 patients with chronic PTSD conditioned by the war and in 60 patients treated for somatic problems by their family physician in Mostar.

**Results:** The prevalence of metabolic syndrome was statistically significantly higher in patients with PTSD (48.3%) than in the control group (25%) ( $P=0.008$ ) and the number of its individual components (test group  $2.38\pm 1.30$  compared to control group  $1.72\pm 1.24$ ) ( $P=0.005$ ). PTSD patients diagnosed with metabolic syndrome had significantly more frequent hyperglycemia ( $P=0.010$ ) and abdominal obesity ( $P=0.044$ ) compared to the control group.

**Conclusion:** The prevalence of metabolic syndrome increased in patients with PTSD compared to the control group.

**Key words:** metabolic syndrome – components – war – post-traumatic stress disorder – prevalence

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### INTRODUCTION

Posttraumatic stress disorder (PTSD) is an entity that can occur in isolated form, and which is also often associated with other psychiatric disorders such as depressive disorders, anxiety disorders, psychosomatic disorders, substance abuse, and alcoholism. Compared to veterans without PTSD, veterans with PTSD have a higher risk of developing dermatological, gastrointestinal, ophthalmic, endocrine, and cardiovascular disease (Perlmutter et al. 2000, Folnegović-Šmalc 2010, Degmenčić & Filaković 2010).

Until recently, much less research attention has been devoted to the physical consequences of mental disorders. However, much data shows that severe mental illnesses have an impact on physical health. Multiple studies indicate that these patients have a shorter life expectancy, and have a higher prevalence of somatic diseases. Research interest directed at the impact of comorbid mental and somatic disorders is increasing and there is growing evidence of the high incidence of metabolic disorders in psychiatric patients. Somatic diseases such as obesity, hyperlipidemia, hypertension, diabetes mellitus II, are increasingly perceived as a significant comorbid condition in patients with severe mental illnesses. It is still not completely clear whether these somatic disorders are components of the pathologic process of mental illness through increased stress and inflammatory processes, genetic susceptibility, environmental factors, or the effects of treatment. Only recently has research in the field of

psychiatry begun to observe this situation in the context of the metabolic syndrome. Patients with metabolic syndrome generally have increased mortality, in particularly mortality from cardiovascular diseases (Jakovljević et al. 2010, Marasović-Jakulica & Britvić 2010, Babić et al. 2007, 2010, Takeshita 2007 et al. 2002).

People who suffer from anxiety and depressive mental disorders develop metabolic syndrome more often than those who do not. The most common comorbid diagnoses occurring with metabolic syndrome are mood disorders (depression), anxiety states, and psychoactive substance use. Over one third of patients with metabolic syndrome have criteria for one or more other psychiatric diagnoses, most commonly depression and anxiety states. The number of obese people in the world, and those with metabolic syndrome is increasing daily and this condition has been declared a global pandemic. The number of patients with complications of metabolic syndrome is also growing, making this the most important epidemiological problem in modern preventive and therapeutic medicine (Molica et al. 1992).

Metabolic syndrome has been described in 19-63% of schizophrenic patients, 42.4% of patients with schizoaffective psychosis, 12-36% of patients with relapsing depression, 8-56% of patients with bipolar affective disorder and 31.9-38.1% of patients suffering from war induced PTSD (Takeshita et al. 2002, Goodwin & Davidson 2005, Weber-Hamann et al. 2002; Schweiger et al. 2000). Recent years have seen an

increasing interest in the association of somatic diseases and chronic PTSD as well as the relationship between traumatic experiences metabolic syndrome (Schweiger et al. 2000). Numerous studies show that traumatic stress can have negative effects on somatic health (Jakovljević et al. 2006) and some research suggests that people with chronic PTSD have more cardiovascular disease and diabetes in comparison to the general population (Maslov et al. 2009, Perlmutter et al. 2000). The objective of this study was to establish the prevalence of metabolic syndrome and its components in patients with PTSD.

## SUBJECTS AND METHODS

### Participants

We recruited 60 patients with chronic, war-conditioned PTSD which were in outpatient psychiatric treatment at the Health Centre Mostar. The mean age was  $49.57 \pm 10.76$  years (mean  $\pm$  standard deviation - SD). All of the patients received customary physical examinations, laboratory tests and comprehensive psychiatric evaluations. The control group comprised 60 males who needed medical attention in the dispensary of family medicine Mostar, aged  $51.52 \pm 15.17$  (mean  $\pm$  SD). All participants in the study were volunteers informed of the purpose and benefits of the project, the potential risks, and their right to ask for further information.

Inclusion criteria were: men 35–65 years of age; psychological health prior to the war; completion of at least primary education; voluntary consent for research. Exclusion criteria were: men younger than 35 or older than 65 years; history of mental problems before the war; the actual presence of another mental disorder. The study also excluded patients who had previously been diagnosed with a chronic somatic disease (diabetes, cardiovascular disease, chronic hyperlipidemia, etc).

### Diagnostic instruments

PTSD was diagnosed using the Harvard Trauma Questionnaire (HTQ – version for Bosnia and Herzegovina) and by experienced psychiatrist. The HTQ helps us diagnose the type of traumatic experience, the presence of PTSD and evaluate the level of symptoms caused by trauma (Molica et al. 1992). The diagnosis of metabolic syndrome was made according to the criteria of the National Cholesterol Education Program – Adult treatment panel III (ATP III) (Expert Panel 2001).

The subjects completed the First General questionnaire and underwent a dedicated sociobiographical analysis for this study. The questionnaire contained information about age, educational attainment, employment, diets, location, economic status, and sought to compare these variables to the consumption of alcohol and tobacco products.

### Anthropometric measurements

Anthropometric parameters that were measured were height, weight and waist circumference. Height and weight were measured with participants standing without shoes and lightly clothed on a multifunction scale (SECA 223). Body mass index (BMI) was calculated as weight divided by the square of the height ( $\text{kg}/\text{m}^2$ ). Waist circumference (WC) in centimeters was measured, with participants standing at a point yielding the smallest circumference between the lower rib margins and the iliac crest. Blood pressure was measured by a mercury sphygmomanometer.

### Blood sampling and analysis

Blood samples were collected from forearm veins, in glass vacuum tubes with no anticoagulant added, from 8.00–9.00 a.m. after an overnight fast of 12 hr and 30 min prior to blood collection. Serum glucose, cholesterol, and triglyceride levels were measured immediately after taking the samples with commercial kits (Olympus Diagnostic, GmbH, Hamburg, Germany) on an Olympus AU 600 automatic analyzer. Our laboratory referent intervals were as follows: blood sugar  $\geq 6.1$  mmol/L and triglyceride  $\geq 1.7$  mmol/L.

### Statistical analysis

Descriptive statistics were applied to our data. Nominal variables are presented as frequency and percentage while parametric variables are shown as the arithmetic mean and standard deviation. The statistical tests used the  $\chi^2$  test for comparison of nominal and ordinal variables and Fisher's exact test for the expected lack of frequency. To compare parametric variables we used the Student's t-test. For processing the data we used a software system SPSS for Windows (version 13.0, SPSS Inc., Chicago, Illinois, USA) and Microsoft Excel (version 11 Microsoft Corporation, Redmond, WA, USA). A probability level of  $p < 0.05$  was considered statistically significant.

## RESULTS

Comparing the marital status between the test and control groups demonstrated that the PTSD patient group were rarely widowed, and that they were frequently employed, in contrast to the control group which were frequently present retirees. The test group was more likely to be of a lower socioeconomic status than the control group. The test group respondents often smoked more tobacco and consumed more alcohol than the controls (Table 1).

The PTSD patient group had a higher prevalence of metabolic syndrome (48.3%) and a higher prevalence of metabolic syndrome components such as hyperglycemia (33.3%) and abdominal obesity (58.3%); which was much more compared to the controls (Table 2).

**Table 1.** Sociodemographic characteristics of the study subjects

Variables	Group		$\chi^2$	p
	PTSD* (n=60)	Control (n=60)		
Age (X±SD)	49.57±10.76	51.52±15.17	0.812**	0.419**
Living place; n (%)			2.748	0.095
Rural	40 (66.7)	49 (81.7)		
Urban	20 (33.3)	11 (18.3)		
Education; n (%)			3.593	0.166
Elementary	17 (28.3)	27 (45)		
Secondary	38 (63.3)	29 (48.3)		
Univerity	5 (8.3)	4 (6.7)		
Marriage; n (%)			10.572	0.005
Single	6 (10)	2 (3.3)		
Married	52 (86.7)	45 (75)		
Widowed	2 (3.3)	13 (21.7)		
Occupation; n (%)			7.924	0.019
Unemployed	24 (40)	21 (35)		
Employed	27 (45)	17 (28.3)		
Retired	9 (15)	22 (36.7)		
Cigarettes; n (%)			14.803	<0.001
Nonsmoker	22 (36.7)	43 (71.7)		
Smoker	38 (63.3)	17 (28.3)		
Alcohol consumption; n (%)			19.535	<0.001
Never	26 (43.3)	49 (81.7)		
Occasionally	19 (31.7)	8 (13.3)		
Often	15 (25)	3 (5)		
Economic status; n (%)			7.015	0.030
Lower	24 (40)	16 (26.7)		
Average	33 (55)	32 (53.3)		
Higher	3 (5)	12 (20)		

X= the aritmetic mean; SD= standard deviation; \*Posttraumatic stress disorder; \*\*Student t-test

**Table 2.** The prevalence of metabolic syndrome and it's components in patients with PTSD and control group

Variables	Group		$\chi^2$	p
	PTSD* (n=60)	Control (n=60)		
Hyperglycemia; n (%)	20 (33.3)	8 (13.3)	6.708	0.010
Abdominal obesity; n (%)	35 (58.3)	23 (38.3)	4.038	0.044
Hypertriglyceridemia; n (%)	24 (40)	17 (28.3)	1.334	0.248
Low HDL-cholesterol; n (%)	19 (31.7)	16 (26.7)	0.161	0.688
Hypertension; n (%)	45 (75)	40 (66.7)	0.645	0.422
Number of components (X±SD)	2.38±1.30	1.72±1.24	2.875	0.005**
Metabolic syndrome; n (%)	29 (48.3)	15 (25)	6.065	0.008

X= the aritmetic mean; SD= standard deviation; \*Posttraumatic stress disorder; \*\*Student t-test

There was no significant difference between the relative prevalence of the metabolic syndrome in patients with PTSD and sociodemographic characteristics (Table 3).

## DISCUSSION

Guided by the idea from the last two decades, of a more relevant, integrated (holistic) medicine concerned with the connection between body and soul, we hypothesized that patients with posttraumatic stress

disorder (PTSD) would have a higher prevalence of metabolic syndrome, and our study has proved to confirm this hypothesis. The results showed that 29 (48.3%) patients with PTSD have metabolic syndrome, compared to 15 (25%) of subjects in the control group, which represents a statistically significant difference. In recent years we have seen an increasing research interest in the association of somatic diseases with chronic PTSD as well as the general relationship between traumatic experiences and metabolic syndrome (Maia 2008).

**Table 3.** The prevalence of metabolic syndrome in patients with PTSD in relation of sociodemographic characteristics

Variables	Metabolic syndrome		$\chi^2$	p
	No (n=31)	Yes (n=29)		
Living place; n (%)			1.410	0.235
Rural	18 (58.1)	22 (75.9)		
Urban	13 (41.9)	7 (24.1)		
Education; n (%)			2.371	0.306
Elementary	7 (22.6)	10 (34.5)		
Secondary	20 (64.5)	18 (62.1)		
University	4 (12.9)	1 (3.4)		
Marriage; n (%)			0.909	0.635
Single	2 (6.5)	4 (13.8)		
Married	28 (90.3)	24 (82.8)		
Widowed	1 (3.2)	1(3.4)		
Occupation; n (%)			0.378	0.828
Unemployed	12 (38.7)	12 (41.4)		
Employed	15 (48.5)	12 (41.4)		
Retired	4 (12.9)	5 (17.2)		
Cigarettes; n (%)			1.610	0.205
Nonsmoker	9 (29)	13 (44.8)		
Smoker	22 (71)	16 (55.2)		
Alcohol consumption; n (%)			0.669	0.716
Never	15 (48.4)	11 (37.9)		
Occasionally	9 (29)	10 (34.5)		
Often	7 (22.6)	8 (27.6)		
Economic status; n (%)			2.967	0.227*
Lower	12 (38.7)	12 (41.4)		
Average	16 (51.6)	17 (58.6)		
Higher	3 (9.7)	0 (0)		

\*Fishers egzact test

Numerous studies shows that traumatic stresses have negative effects on somatic health (Jakovljević et al. 2010), and some studies suggest that people with chronic PTSD have more cardiovascular disease and diabetes compared with the general population (Marasović Jakulica & Britvić 2010, Babić et al. 2010). Studies dealing explicitly with the association of metabolic syndrome and chronic PTSD are very rare. Jakovljevic and colleagues found an increased prevalence (31.9%) of metabolic syndrome in PTSD patients, with these patients also having a stronger intensity of metabolic syndrome. Babić and coworkers found metabolic syndrome in 35% of PTSD patients, and Maslov and colleagues in 38.1%. The prevalence of metabolic syndrome is higher with a more intense clinical expression of PTSD, and when PTSD is comorbid with another mental disorders (Babić et al. 2007, Takeshita et al. 2002)

Only recently has research in the field of psychiatry begun to observe this situation in the context of the metabolic syndrome. Data from the literature suggests that patients with metabolic syndrome generally have increased mortality, particularly mortality from cardiovascular diseases (Goodwin & Davidson 2005, Weber-

Hamann et al. 2002, Schweiger et al. 2000, Jakovljević et al. 2006). Interest in metabolic syndrome is increasing and there are studies that investigate the prevalence of metabolic syndrome in psychiatric illnesses. Metabolic syndrome is described in 19-63% of schizophrenic patients, 42.4% of patients with schizo-affective psychosis, 12-36% of patients with relapsing depression, 8-56% of patients with bipolar affective disorder and 31.9-38.1% of patients with PTSD from the war (Maslov et al. 2009, Perlmutter et al. 2000, Anderson et al. 2000, Deyekin et al. 2001).

In this study, hyperglycemia and abdominal obesity as components of metabolic syndrome had significantly different prevalence ratios between the observed groups. These components were represented in the group of patients with PTSD compared to controls. The average number of components of metabolic syndrome in patients with PTSD was 2.38±1.30, which represents a statistically significant difference compared to the control group, which had an average of 1.72±1.24 components.

Due to a higher prevalence of metabolic syndrome in PTSD patients, these patients have a reduced quality of life, shorter life expectancy, and often suffer from a

variety of other somatic diseases. The prevalence of individual components of metabolic syndrome in patients with PTSD is even greater. Although research investing the link between PTSD and metabolic syndrome is still in its infancy, this study lends support to the thesis that PTSD is a multisystem disorder that can eventually develop into many mental or somatic diseases including diabetes and cerebrovascular disease (Maslov et al. 2011). Somatic diseases such as obesity, hyperlipidemia, hypertension, and diabetes mellitus type 2, are recently increasingly understood as an important comorbid condition in patients with severe mental illnesses. It is still not completely clear whether these somatic disorders are components of the pathologic process of mental illness through increased stress and inflammatory processes, genetic susceptibility, environmental factors, or the effects of treatment (Weisberg et al. 2002).

Our results show that in relation to sociodemographic characteristics between the study groups there was a statistically significant difference in marital status, employment and economic status and the consumption of alcohol and tobacco products; though no significant difference was found in relation to the incidence of metabolic syndrome in patients with PTSD and these sociodemographic characteristics. The high prevalence (48.3%) of metabolic syndrome in the PTSD group can be explained by the severe clinical picture of PTSD and the presence of comorbid psychiatric disorders. Given that all subjects were suffering from chronic, war-conditioned PTSD, and that almost 16 years have passed since the conclusion of the war, we found a seriously ill group of patients aged about 50 years, of whom a significant number were smoking tobacco, drinking excessive amounts of alcoholic beverages and were of a low socioeconomic status.

Finally, as we have completed this study and have recognized certain flaws and limiting factors, suggestions arise for future research. A larger sample would provide more reliable results, so subsequent research should include a larger number of subjects. Future research should take into account comorbid psychiatric disorders, secondary trauma, and should attempt to better align the test and control groups vis a vis their sociodemographic characteristics. It is important to continually emphasize the relevance of this research and to inform general practitioners and various specialists, especially psychiatrists, of the need for regular clinical and laboratory tests and monitoring of risk factors in this patient group. Given our data indicates that the prevalence of metabolic syndrome is greater in PTSP patients than in the general population, and given the often unknown pathophysiological relationship and other scientific uncertainties, it is necessary to continue research that aims to establish the connection between these two disorders.

## CONCLUSION

The prevalence of metabolic syndrome was statistically higher in patients with PTSD (48.3%) compared to the control group (25%) as well as the prevalence of its individual components (case group  $2.38 \pm 1.30$  compared to control group  $1.72 \pm 1.24$ ). PTSD patients diagnosed with metabolic syndrome had significantly more frequent hyperglycemia and abdominal obesity compared to controls. We did not find a statistically significant differences in the prevalence of metabolic syndrome in relation to sociodemographic characteristics in patients with PTSD.

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**Conflict of interest :** None to declare.

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