

## THE PREVALENCE OF METABOLIC SYNDROME IN WAR VETERANS WITH A CHRONIC POSTTRAUMATIC STRESS DISORDER

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### SUMMARY

**BACKGROUND:** The Posttraumatic Stress Disorder (PTSD) and metabolic syndrome represent a growing number of public health problems in post-war countries. There is more and more evidence about a relationship between PTSD and metabolic syndrome as well as the research that indicates a high prevalence of metabolic syndrome in people suffering from PTSD. Understanding the relationship between PTSD and metabolic syndrome are important clinical and theoretical issues.

**OBJECTIVES:** The objective of this study was to examine the prevalence of metabolic syndrome in war veterans with a chronic PTSD.

**METHODS:** Metabolic syndrome was investigated in 100 male war veterans with combat PTSD and in 79 males who needed medical attention in a dispensary of family medicine.

**RESULTS:** According to NCEP: ATP III metabolic syndrome was found in 35 % of war veterans with PTSD. Metabolic syndrome was identified more frequently in PTSD patients with co-morbid depression (63.6%) and in war veterans with PTSD of high intensity (66.7%) .

**CONCLUSION:** Metabolic syndrome was found in more than 1/3 patients suffering from a chronic PTSD. The frequency was higher if the clinical presentation of a chronic PTSD was heavier and if PTSD was co-morbid with a depressive disorder.

**Key words:** war veterans, PTSD, metabolic syndrome, prevalence.

### INTRODUCTION

The war that occurred in Bosnia and Herzegovina (B&H) has unfortunately given us the opportunity to better understand developments and events related to war stress and stress conditioned mental disorders, which during the war happened to many civilians, soldiers, and especially to more traumatized war veterans (1).

There are no valid epidemiological studies in B&H that could more accurately identify all the important aspects of the war trauma and its consequences. However, on the basis of research that was conducted in different time periods and on different population samples whose results have been published

thus far, it is evident that the consequences of war trauma are numerous and very complex (2).

The Posttraumatic stress disorder (PTSD) is a diagnostic entity, which often occurs as a result of the catastrophic war trauma. It may appear in an isolated form and is often associated with other psychiatric disorders such as: depressive disorders, anxiety disorders, psychosomatic disorders, psychoactive substance abuse and alcoholism. Unlike the war veterans without PTSD, the war veterans suffering from PTSD have a higher risk of developing: dermatological, gastrointestinal,



ophthalmologic, endocrinological and cardiovascular diseases (3,4,5).

Metabolic syndrome is also known as dysmetabolic syndrome, insulin resistance syndrome, Reavenov syndrome, CHAOS, a new world syndrome, civilization syndrome, or syndrome X "deadly quartet", the combination of metabolic, anthropometrical and hemodynamic disorder that involves a disruption of regulating body weight, metabolism carbon hydrates and lipids (low lipoproteins with large density, HDL and increased triglycerides), as well as disturbance of blood pressure regulation (6,7,8).

Although the criteria for diagnosing metabolic syndrome has been ambiguous, incomplete and criticized by some authors (7,8,9), medical interest for researching metabolic syndrome is increasing.

There are more and more indicators that point out to a correlation between mental disorders (schizophrenia, PTSD, depression, affective bipolar disorder, personality disorder) and metabolic syndrome as well as research that shows a high prevalence of metabolic syndrome associated with mental disorders including PTSD.

## **POSTTRAUMATIC STRESS DISORDER**

In the professional literature, but also in literary works (Ksenofont, Herodotus, Homer, Shakespeare, Krleža, Marinkovic, B&H folk songs and stories, etc.), there is a series describing psychological states that have resulted from the war stress that also match today's description of PTSD clinical images (10).

Although PTSD has been mentioned in the past couple of decades, it was almost unknown to our experts in public 15 years ago. The World Health Organization (WHO) introduced PTSD only in its Tenth revision of the International Classification of Diseases (ICD-10) and related health problems, which we have used since the beginning of 1995. PTSD, along with a panic dysfunction, agoraphobia, specific and

social phobias, obsessive-compulsive disorder and generalized anxiety disorder, falls into a large group of so called anxiety disorders. The basic characteristic of this disorder is the appearance of pathological anxiety and development of characteristic symptoms, which happen in response to stressful events or a situation of an extremely threatening or catastrophic nature.

In the general population, PTSD ranges from 1-10% and in a sample of the Vietnam War veterans it ranges between 7-67% (11). On the territory of B&H there is a lack of systemized epidemiology research on PTSD. A number of individual research studies on different patterns and indirect indicators, shows that virtually the entire population of B&H during the war experienced psycho-physical traumas and there are a lot of people suffering from PTSD. The presence of PTSD in B&H, due to insufficient research, can be analyzed only on a partial sample. Numerous individual research studies showed a high percentage of the war-conditioned chronic PTSD presence, ranging from 33.3% to 68.3% (12,13,14,15,16,17).

There is a large number of studies on traumatic stress, however, the sufficient knowledge about theoretical comprehension of complex forms of mutual activities between the nature of stressful events, personality features and the process of coping as well as psycho-biological mechanisms, which have been affected by trauma and cultural response of those who have been the victims still does not exist (18).

Long-term or chronic anxiety can have a significant role in pathogenesis of metabolic syndrome. Allostatis is a permanent process of adaptation through which an individual passes while facing increased and demanding challenges (19).

Allostatic load indicates cumulative physiological natural attrition that comes from repeated efforts to adjust to a stress cause in a given time. It reflects cumulative, negative effects of adaptation to different



psycho-social challenges and the poor environment, which are imposed by a genetic predisposition of an individual, as well as the development and learned factors related to behavior and lifestyle, such as physical activity, nutrition, alcohol consumption and smoking (20).

### **METABOLIC SYNDROME**

Metabolic syndrome is a set of metabolic abnormalities, which is associated with increased risk of a cardiovascular disease. These abnormalities include a disorder in glucose metabolism, abdominal obesity, disturbance of lipid concentration in plasma, especially low levels of high lipoprotein cholesterol in plasma (HDL-C), high triglyceride levels in plasma and increased blood pressure. Although each of these components of metabolic syndrome in itself represents a risk factor for a cardiovascular disease and mortality when existing together, the increased risk is at least an additional element (21).

Due to the importance of metabolic syndrome as a risk indicator for a cardiovascular disease, the Expert Panel for detection, evaluation and treatment of high blood cholesterol in adults (Panel for the Treatment of Adults of a National Educational Program for Cholesterol, NCEP / ATP III) and WHO announced definitions of metabolic syndrome, which should be used to diagnose it. According to the definition of NCEP/ATP III, the diagnosis of metabolic syndrome is made when a person has at least three components of metabolic syndrome that are specified in the definition. WHO's definition is similar and the difference is mainly in that it requires a diagnosis of diabetes, disturbed regulation of glucose or insulin resistance with two or more other components for diagnosing metabolic syndrome. Despite the differences in a definition, the definition of NCEP / ATP III and WHO identifies the same person in 85% of cases (22).

WHO defines metabolic syndrome by the existence of insulin resistance with any of the two additional criteria such as:

- Elevated blood pressure  $\geq 140/90$  mm Hg or antihypertensive drug therapy;
- Triglyceride concentration in plasma  $\geq 1.7$  mmol/L;
- Concentration of HDL  $< 0.9$  for men;  $< 1.0$  mmol/L for women;
- Body Mass Index (BMI)  $> 30$  and/or the ratio of waist/hip  $> 0.9$  for men and, and  $> 0.85$  for women;
- Albumin concentration in urine  $> 20$   $\mu$ gram/min, the ratio of albumin/creatinine  $> 30$ mg/g.

According to the American organization NCEP/ATP III, metabolic syndrome is defined by the existence of at least three or more of the following criteria:

- Fasting glucose levels  $\geq 6.1$  mmol/L;
- Serum triglyceride  $\geq 1.7$  mmol/L;
- Serum HDL-c  $< 1.04$  (m),  $1.30$  mmol (w);
- Blood pressure  $\geq 130/85$  mm Hg;
- Waist circumference  $\geq 102$  cm (m) or  $88$  cm (w).

According to WHO data in Europe, 7-36% of men and 5-22% of women aged between 40 and 45 years meets the criteria of being diagnosed with metabolic syndrome. According to some data, 24% of adult Americans have metabolic syndrome (23).

Etiopathogenesis in patients with mental disorders is complex and insufficiently explained, but it is known that the interaction of stress, hypercortisolemia disorder and the improper functioning of the immune system all contribute to the development of metabolic syndrome in people suffering from PTSD and other mental disorders. Most often, pathophysiological explanation of metabolic syndrome is a resistance to insulin, although the effect of insulin in vivo is not always



associated with the presence of the syndrome (24).

Due to an increased activity of HPA-axis, there is an increased ejaculation of cortisol, which affects visceral accumulation of a body fat. According to most authors, this increase in the quantity of abdominal fat tissue is a fundamental pathophysiological change, which through the development of insulin resistance leads to the development of other components of metabolic syndrome (25,26,27).

Metabolic insulin resistance is caused by changes in a body, which in an early period begins as a compensatory protective mechanism, and in a later period turns into an expressive pathological process. The basis of the process is made up of hyperenergetic state in the organism whether it is an endogenic hyperenergetic state (the amount of energy from food intake is equal but exercise is reduced) or egzogenic hyperenergetic condition where the amount of energy from food intake is increased while at the same time and very often the physical activity is reduced (28).

Metabolic syndrome usually occurs due to an unhealthy lifestyle, lack of exercise, increased calorie consumption and increased exposure to stress as well as the inability to deal with stressful situations successfully. The risk factors include: genetics, stress, lifestyle, the internal capacities of defense and emotional hypersensitivity. Hereditary genetic causes have not yet been precisely defined. Stress is considered as one of the causes because it disturbs the hormonal balance and it increases the tendency of fat tissue accumulation in the abdominal area and other diseases associated with it.

#### **PTSD AND METABOLIC SYNDROME: RELATINOSHIP**

Research that deals with the connection between PTSD and metabolic syndrome is in its early stages. It is evident that more research should be conducted because the previous work in this field indicates possible

existence of a causal connection between these two disorders (29,30,31,32).

The group of authors from the University of Washington in Seattle (USA) announced in 2002 the results of a research related to a chronic stress correlation, metabolic syndrome and coronary disease. Dr. Raikkonen and associates explored the two-way type connection and concluded that people with metabolic syndrome more often suffer from depression, uncontrolled rage and tension. On the other hand, people with mental disorders in a form of depression, uncontrolled rage and tension often do not develop metabolic syndrome (33,34).

The complexity of the problems of perception about metabolic syndrome and PTSD includes different influential factors through various variables: constitutional factors, developmental conditions, premorbid situation, the maturity level, emotional stability, intelligence and interaction in etiopathogenesis. Frequent comorbid diagnoses with metabolic syndrome include: mood disorders (depression and anxiety states, the use of psycho active substances. One or two of psychiatric diseases is usually developed in 38% of people suffering from metabolic syndrome; most often depressive or anxious states. The number of obese people in the world, as well those suffering from metabolic syndrome is growing daily. Around the world, this situation has been declared as the metabolic syndrome pandemic. While the number of people with metabolic syndrome is increasing worldwide, there are also more and more patients suffering from various complications of the metabolic syndrome, which has made this a major epidemiological issue in a contemporary preventive and therapeutic medicine (28).

#### **RESULTS AND DISCUSSION**

We recruited 100 male veterans with combat related PTSD, who were consecutively admitted to the psychiatric department in the Clinical Hospital Mostar. The control study



group consisted of 79 males who needed a medical attention in a dispensary of family medicine in Mostar. PTSD was diagnosed using DSM-IV criteria (APA) by an experienced psychiatrist. The clinical psychologist applied the Harvard Trauma Questionnaire based on DSM-IV criteria to evaluate post-traumatic stress reaction (28). The diagnosis of metabolic syndrome and its components was based on ATP III diagnostic criteria (Adult Treatment Panel III).

This paper presented the preliminary results of the metabolic syndrome frequency in war veterans suffering from a chronic PTSD in the area of B&H. The final results will be published after the completion of the research.

Our preliminary research shows a high prevalence of metabolic syndrome in respondents with a chronic PTSD (35%) as well as the control group (41.8%). Among examined groups, the statistically significant difference was not found. Metabolic syndrome was identified more frequently in PTSD patients with co-morbid depression (63.6%) and in war veterans with PTSD of high intensity (66.7%). When compared to the control group, it represents a statistically significant difference ( $p < 0001$ ).

Trief et al. (35) found that the prevalence of metabolic syndrome was present in 20-30% in the middle and older age people in the general population. Violani et al. (36) and Babić et al. (37) reported a significantly greater prevalence of metabolic syndrome in police officers and war veterans with severe PTSD symptoms. In recent years, professional literature has shown more evidence related to high frequency of metabolic disorders in psychiatric patients. Somatic diseases such as obesity, hyperlipidemia, hypertension and diabetes mellitus II have lately been treated as very important comorbid states in patients suffering from more difficult mental disorders. It is not entirely clear whether these disorders are a part of the pathological process itself and mental disorders inflicted by increased stress and inflammatory

process, genetic vulnerability or environmental factors, or the consequences of treating the disease. The latest research in the field of psychiatry has begun to examine this situation in the context of metabolic syndrome. People suffering from metabolic syndrome generally have an increased mortality, especially the mortality related to cardiovascular diseases (28,33,34,38,).

In recent years, there has been a great interest in researching correlation between somatic diseases and chronic PTSD as well as the linkages between traumatic experiences and metabolic syndrome (39). Numerous studies show that traumatic stress may have a negative impact on somatic health (40), and other research shows that those suffering from a chronic PTSD when compared to the general population have a higher number of cardiovascular diseases and diabetes (41,42). As of today, the available data links cognitive damage, abdominal obesity, reduction of bone density, type II diabetes and hypertension in depressive patients with hypercortisolemia, while currently there is no clear evidence about the connection between depression and hyperlipidemia (43,44,45,46).

There has not been a lot of research that deals with a relationship between metabolic syndrome and chronic PTSD. Jakovljević et al. (5) found that those suffering from PTSD had metabolic syndrome presence of 31.9%, while those suffering from a higher PTSD intensity had 51.9% metabolic syndrome presence. Although the research on correlation between PTSD and metabolic syndrome is still in its early stages, previous research has supported a thesis that PTSD is multisystematic disorder which represents a developmental phase in the pathogenesis of many mental disorders and somatic diseases including diabetes and CVD (5,47). Obtained data are complementary with the current results of our research, which indicates people suffering from PTSD have a higher prevalence of metabolic syndrome than those from the general population.



## CONCLUSION

Metabolic syndrome was diagnosed in more than one third of people suffering from a chronic PTSD. The frequency was higher if

the clinical presentation of a chronic PTSD was heavier and if the PTSD was comorbid with a depressive disorder.

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