

# Metabolic Syndrome and Mental Health in Posttraumatic Stress Disorder Patients

Hassan SHAHMIRI (✉ [medicalresco@yahoo.com](mailto:medicalresco@yahoo.com))

Aja University of Medical Sciences

Arsia TAGHVA

Aja University of Medical Sciences

Mohammad-Reza EBRAHIMI

Aja University of Medical Sciences

Seyyed Behnam HASHEMI URIMI

Tehran University of Medical Sciences School of Medicine

Amir-Mohsen RAHNEJAT

Aja University of Medical Sciences

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## Research

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# Abstract

**Background:** Posttraumatic stress disorder (PTSD) is an abnormal physiologic and psychological reaction in person with severe traumatic history. In recent studies, the relationship between PTSD and some other disease apparently unrelated to psychological situations such as cardiovascular diseases, diabetes, and metabolic syndrome has been revealed. Thus, the aim of this study was to survey the prevalence of metabolic syndrome and mental health in PTSD patients.

**Methods:** The research design was retrospective cohort study. Subjects were consisted of 142 Iran-Iraq war veterans with PTSD (age: 40-60 years) and the control group was consisted of 153 veterans without PTSD. Data was collected using questionnaires, physical exams and laboratory tests.

**Results:** Prevalence of metabolic syndrome was 45.1% in PTSD group and 17% in control group. In addition blood pressure, triglyceride and fasting blood sugar in PTSD group were significantly higher than control group ( $p < 0.05$ ). Also, PTSD patients had significant high rates of psychiatric disorders.

**Conclusion:** PTSD patients are more prone to metabolic syndrome and psychiatric disorders than control group.

## Background

Posttraumatic stress disorder (PTSD) is characterized by the onset of psychiatric symptoms immediately following exposure to a traumatic event that involve actual or threatened death or injury or threats to the physical integrity of oneself or others. Among high risk groups whose members experienced traumatic events, the lifetime prevalence rate ranges from 5 to 75 percent [1].

Individual with PTSD shows symptoms in three domains: Re-experiencing, avoidance, and hyperarousal. PTSD is an abnormal physiologic and psychological reaction in person with severe traumatic history. PTSD has two types, acute and chronic. Patients in acute form begin the symptoms for less than three months, while in chronic type, they have been diagnosed for more than three months. Sometimes PTSD can occur with a delayed start and symptoms appear six months or many years after the accident. Clinicians must also consider individuals preexisting biological and psychological factors and events that happened before and after the trauma [2].

Relationship between PTSD and other diseases like cardiovascular problems and diabetes have been reported [3, 4]. Genetic has a very important role in getting PTSD [5]. There are some genetic relations between PTSD and stress disorders, nicotine and alcohol addiction and drug abuse [6].

The risk of PTSD after a severe environmental stressor is 8% and 20% in men and women, respectively. The prevalence of PTSD is much more in persons with history of experiencing war [7].

The predisposing factors for PTSD in soldiers are unstable families, being punished in childhood, and depression before getting into army. Preventing factors for them are high educational level, being older

when they get into army, higher socioeconomic level, good family relations, and good social support [8].

Stress may lead to release some hormones which can reduce the activity of hypothalamus that have a role in PTSD [9]. Lots of PTSD patients show lower levels of cortisol and higher levels of catecholamine in urine [10]. These facts can show some malfunctions in hypothalamus pituitary adrenal axis during the PTSD [11].

Patients with PTSD have lower levels of serotonin that it can lead to some PTSD symptoms like anxiety, anger, sensitivity, impulsive moves, and suicidal thoughts [12].

PTSD is diagnosed by diagnostic and statistical manual of mental disorders, 4th edition, text revision (DSMIV-TR) criteria. The prevalence of PTSD has been increasing during recent years [2]. In Iran, because of the war and other traumatic events, PTSD has a high prevalence. PTSD can cause a chronic inflammatory status in body that can lead to immune system problems and higher risk of some other diseases like metabolic syndrome, autoimmune and inflammatory diseases, chronic infections, and diabetes [13, 14].

Metabolic syndrome is described by a bunch of symptoms such as high blood pressure, obesity, dyslipidemia, and glucose intolerance. Therefore, it is one of the main risk factors for diabetes type 2 and cardiovascular diseases [15, 16]. Metabolic syndrome has a high prevalence in Middle East and its diagnosing in early stages is very important. According to international diabetes federation (IDF) criteria, metabolic syndrome includes waist circumference  $\geq 90$  cm plus two or more of these parameters : triglyceride (TG)  $\geq 150$  mg/dl, fasting blood sugar (FBS)  $\geq 100$  mg/dl, high density lipoprotein cholesterol (HDL)  $< 40$  mg/dl, diastolic blood pressure (DIABP)  $\geq 85$ , and systolic blood pressure (SYSBP)  $\geq 130$  [17].

In this study, we have collected information including metabolic syndrome parameters, mental health status, medical history, and demographic information in PTSD patients and compared them with the control group.

## Methods

A retrospective cohort study was performed in an army hospital in Tehran city, Iran in 2014. The study population were the Iranian veterans of Iran- Iraq war. PTSD patients were diagnosed with DSMIVTR criteria and it was confirmed by two psychiatrists.

The control group were randomly selected from the individuals who had a history of experiencing Iran-Iraq war for more than one year and had no PTSD symptoms (confirmed by psychiatrist). The participants in both groups aged between 40 and 60 years.

People who were involved in this study were informed properly about the purpose of the study and all signed an informed consent. Data was gathered from patients and control group through physical exam, questionnaires, and laboratory tests. Questionnaires and information forms included the following characteristics: 1) socio-demographic and anthropometric variables: Age, education, socioeconomic level,

marital status, number of children, height, weight, and waist circumference; 2) risk factors including history of head trauma, diabetes, cardiovascular problems, seizure, medications, physical injury caused by war, obesity, blood pressure, smoking, drug abuse, other mental illnesses, and family history of mental illness; 3) GHQ questionnaire consisted of 28 questions to assess the mental health.

Weight and height of them were measured by standard device and their body mass index (BMI) was calculated. A physician measured the blood pressure in the time of natural exhale.

The laboratory tests were included FBS, TG, Cholesterol, HDL, and LDL. Laboratory tests were performed by enzymatic methods by BT-3000 and sysmex 800i analyzer. Data was analyzed with SPSS version 18 software and independent sample student's t-test and Chi square test were used for comparing the two groups. A p value less than 0.05 was considered significant in all tests.

## Results

Totally 295 people participated in this study. All subjects were male. The mean age was 51.2 and 50.3 years in PTSD and control group, respectively. Table 1 shows some demographic information in two groups.

Table 1  
Comparison of demographic information between the PTSD and control groups.

Factor	Patient group	Control group
Number	142	153
Age	51.2 ± 3.7	50.3 ± 2
Duration of attending war (month)	18.3	12.6
Marital status:		
Married	92.3%	95.3%
Single	7.7%	4.7%
Children number	3.2 ± 0.7	2.8 ± 0.6
History of smoking	64.8%	34.3%
History of drug abuse	16.7%	6.2%
History of injury during war	70.2%	20.3%

### [Table 1]

Prevalence of metabolic syndrome according to IDF criteria in the PTSD group and control group was 45.1% (64 patients) and 17% (26 patients), respectively. The difference was significant between two

groups (p = 0.001).

High blood pressure was found in 41.4% of the PTSD group and 35.2% of the control group. Waist circumference  $\geq$  90 cm was reported in 60% of the PTSD group and 58% of the control group. Also TG  $\geq$  150 was seen in 54.3% of the PTSD group and 41.2% of the control group. FBS  $\geq$  100 in the PTSD group was significantly more than the control group (Table 2). Other laboratory tests had not significant difference between two groups. Table 3 shows some risk factors and history of medical and mental problems in two study groups.

Table 2  
components of metabolic syndrome and comparison between PTSD  
and control groups

<b>Factor</b>	<b>PTSD</b>	<b>Control</b>	<b>p value</b>
BMI(kg/m <sup>2</sup> )	27.3 $\pm$ 1.2	26.5 $\pm$ 2.1	P = 0.06
BMI $\geq$ 25 (%)	42.3%	38.2%	
Waist circumference(cm)	95.2 $\pm$ 6.2	90.2 $\pm$ 7.1	P = 0.07
Waist c $\geq$ 90 (%)	60%	58%	
TG (mg/dl)	163.2 $\pm$ 24	153.4 $\pm$ 24.2	P = 0.045
TG $\geq$ 150 (%)	54.3%	41.2%	
HDL (mg/dl)	43 $\pm$ 13.2	45.3 $\pm$ 7.2	P = 0.07
HDL < 40 (%)	31.2%	29.1%	
FBS(mg/dl)	104.2 $\pm$ 8.2	97.3 $\pm$ 6.2	P = 0.006
FBS $\geq$ 100 (%)	24.2%	20.2%	
SBP(mmHg)	146 $\pm$ 28	132 $\pm$ 24	P = 0.02
DBP(mmHg)	87 $\pm$ 12	81 $\pm$ 8	P = 0.03
SBP $\geq$ 130 &DBP $\geq$ 85 (%)	41.4	35.2	P < 0.05

Table 3  
Risk factors and history of medical and mental problems in the PTSD  
and control groups

Factor	PTSD	Control	p value
Head trauma	23.2%	2.3%	0.013
Diabetes	9.2%	3.1%	0.019
Seizure	23.3%	1.3%	0.017
Cardiovascular disease	17.3%	10.8%	0.02
Family history of psychiatric problems	10.2%	8.3%	0.06
History of Anxiety disorders	30.2%	10.2%	0.001
History of major depressive disorder	8.3%	3.2%	0.001

[Table 2]

[Table 3]

According to the results 10.2% of subjects in the PTSD group had no risk factor and 30.2% had more than three risk factors for metabolic syndrome. Score 23 or more in GHQ questionnaire was seen in 81.2% of PTSD group. Mean of GHQ score in the PTSD group was 36.01. Anxiety and insomnia in 91.2%, social dysfunction in 80.2%, and somatic symptoms in 72.1% of PTSD patients were present. Also 78.2% of PTSD patients had severe depression and 8.2% of them reported suicidal idea.

[Table 3]

## Discussion

This study showed that prevalence of metabolic syndrome in PTSD patients was 45.2%. Babic et al reported that 35% of PTSD patients had metabolic syndrome. Also 23.3% of the veterans with low intensity PTSD had metabolic syndrome [18]. Another research indicated that 31.9% of Croatian war veterans with PTSD had metabolic syndrome [16]. Heppner et al reported an association between PTSD and metabolic syndrome in a cohort of middle-aged primarily male American veterans. They showed that 40% of PTSD patients had metabolic syndrome [19].

In Iran prevalence of PTSD patients with metabolic syndrome compared with developed countries is higher, because most patients who entered this research had a long lasting history of PTSD since Iran-Iraq war. So they have been exposed to risk factors more than other PTSD patients. Another reason for this difference can be their lower socioeconomic level. It can increase risk of drug abuse, smoking and less care about their health and lead to more prevalence of metabolic syndrome.

Our findings showed a significant relation between PTSD and higher risk of metabolic syndrome. A significant relation between PTSD and risk of diabetes has been stated [4, 20]. Also some other studies reported significant relation between PTSD and metabolic syndrome [21–23].

Some studies revealed that impaired hypothalamus pituitary adrenal axis and immune reaction can be reasons for higher prevalence of metabolic syndrome in PTSD patients [10–12].

It is indicated that education level, socioeconomic status, and income are significantly different in these patients. This can lead to an unhealthy life style that has a relation with metabolic syndrome [24].

Smoking is significantly more prevalent in these patients and there is a genetic relationship between smoking and drug abuse with PTSD [6].

Similar to our study, some reported that head trauma, history of seizure, drug using, and coronary heart disease were significantly more common in PTSD patients [25].

Our study results showed that GHQ scores in patients with PTSD was severely disrupted. The level of this difference with the control group was more severe than physical issues. Most mental problems were related to anxiety and insomnia that were significantly higher than the control group. It seems that the lack of adequate social support in these patients and low level of socioeconomic cultural status has severely influenced their mental health.

GHQ score between PTSD with and without metabolic syndrome groups was also significantly different. This can be explained by the GHQ questionnaire score that is directly related to the severity of PTSD, so that the risk of metabolic syndrome in patients with more severe PTSD is much higher. Another study similar to ours reported significant relationship between PTSD and prevalence of depression, anxiety and metabolic syndrome [26].

## **Conclusion**

This study showed that there is a significant relation between PTSD and metabolic syndrome. In addition PTSD patients are more prone to psychiatric disorders than control group. Also diabetes and heart disease are significantly more common in PTSD patients that points out the need for prevention and more serious screening in this group.

## **Declarations**

## **Ethics approval and consent to participate**

The study was conducted in accordance with the principles of the Declaration of Helsinki and the institutional review board approved the study. The study protocol was also approved by the Ethics Committee of the Aja University of Medical sciences.

## Consent for publication

People who were involved in this study were informed properly about the purpose of the study and all signed an informed consent. The identities were protected, as specified in their signed informed consents and all data were confidentiality-coded. The manuscript does not contain data from any individual person.

## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they have no competing interests.

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The study was founded by Aja University of Medical Sciences.

## Authors' contributions

HS, MRE, AMR and SBBHU analyzed and interpreted the patient data. AT was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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