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Body mass index in male Caucasian veterans with or without posttraumatic stress disorder

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ABSTRACT

Obesity (defined as body mass index (BMI) higher than 30), is a serious and global public health problem, associated with increased morbidity and mortality and it represents a risk factor for developing various somatic and psychiatric disorders. Combat-related posttraumatic stress disorder (PTSD) is frequently associated with increased BMI which leads to overweight and obesity. We therefore evaluated BMI in the ethnically uniform Croatian male participants of the Caucasian origin, combat exposed veterans with or without PTSD, controlled for the effect of trauma, age, smoking, alcohol consumption, physical activity and comorbid psychiatric disorders, and in age matched healthy control subjects. BMI did not differ significantly between veterans with or without PTSD and healthy control subjects, or when participants were subdivided according to the age groups, BMI categories, or the presence of psychiatric disorders. Limitation of the study might be a small number of veterans with or without PTSD. Similar BMI was found in Croatian male veterans with or without PTSD, and age matched healthy control subjects. The data provided evidence of overweight and obesity in large number of veterans but also in healthy control subjects, and indicated that public health organizations should develop more effective strategies to prevent overweight and obesity.

1. Introduction

Obesity is a serious and global public health problem (WHO, 2000, 2006). Overweight and obesity are characterized by abnormal or excessive accumulation of fat that may impair health, and are measured using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Overweight is defined by a BMI ≥ 25.0 and obesity by a BMI ≥ 30.0. Obesity is associated with increased morbidity and mortality worldwide since it represents a risk factor for developing type-2 diabetes, cardiovascular diseases, and certain types of cancer (National Task Force on the Prevention and Treatment of Obesity, 2000; Turek et al., 2001), but also psychiatric disorders (Carpenter et al., 2000; Hach et al., 2007), such as mood disorders, major depressive disorder, anxiety disorders and especially with posttraumatic stress disorder (PTSD) (Scott et al., 2008; Seng et al., 2005; Perkonigg et al., 2009; Vanltallie, 2002; Vieweg et al., 2006a,b,c, 2007). Veterans with combat-related PTSD frequently develop other psychiatric disorders (Kozaric-Kovacic and Borovecki, 2005; Kozaric-Kovacic and Kocijan-Hercigonja, 2001), and are at risk to develop obesity, diabetes mellitus (Trief et al., 2006), heart disease, and substance or alcohol use disorders (David et al., 2004). Veterans with PTSD with increased BMI would more frequently develop diabetes mellitus, hypertension, and cardiac arrhythmia, medical conditions that might increase their morbidity and mortality (Kubzansky et al., 2007).

In a study conducted on 29,193 subjects in European Union, the rate of overweight ranged from 34% in Italy to 59% in Malta (Abu-Omar and Ruttena, 2008). In Croatia, epidemiological data (Cubrilo-Turek et al., 2007; Kern et al., 2005; Turek et al., 2001) showed that Croatian subjects are overweight (more than 41%) or obese (additional 18%), according to the criteria of WHO. Obesity is influenced by gender (Barry et al., 2008). The studies evaluating BMI in military veterans with combat-related PTSD are mostly retrospective, using databases (Vieweg et al., 2006a, 2007), self-reported height and weight data (Arterburn et al., 2004), a small number of subjects (David et al., 2004; Smith et al., 2009), or missed the corresponding control groups of veterans without PTSD (Vieweg et al., 2006a, 2007). Since military veterans with PTSD are more frequently obese (Vieweg et al., 2007), and obesity co-occurring in PTSD is influenced by ethnicity and race

Abbreviations: ANCOVA, analysis of covariance; ANOVA, analysis of variance; BMI, body mass index; CAPS, Clinician Administered PTSD Scale; M.I.N.I., Mini International Neuropsychiatric Interview; PTSD, posttraumatic stress disorder.

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Table 1
Comparison of age, BMI and lifestyle variables between war veterans with and without PTSD.

	Veterans with PTSD ($N=269$)	Veterans without PTSD ($N=209$)	Statistics	p
	Mean ± SD	Mean ± SD		
Age (years) (mean ± SD)	41.4 ± 6.1	40.8 ± 6.1	$t=0.995$	0.320
BMI (kg/m^2) (mean ± SD)	27.6 ± 3.8	27.7 ± 3.6	$t=0.327$	0.746
Current smoker (N (%))	140 (52.0)	85 (40.7)	$df=2$; $\chi^2=6.108$	0.013*
Alcohol consumption (N (%) weekly)	40 (14.9)	61 (29.2)	$df=2$; $\chi^2=14.466$	0.001*
Engaged in physical activity (N (%) weekly)	75 (27.9)	102 (48.8)	$df=2$; $\chi^2=22.081$	0.001*

t = Student's t-test.
* χ^2 test.

(Vieweg et al., 2007), gender (Perkonigg et al., 2009), socioeconomic factors (Faith et al., 2002; Friedman and Brownell, 1995; Vieweg et al., 2006b), comorbid alcohol use (David et al., 2004), and different comorbid medical (Vieweg et al., 2007) conditions and health risk factors (Vieweg et al., 2006c), the aim of this study was to evaluate BMI in the ethnically uniform Croatian male participants of the Caucasian origin, combat exposed veterans with or without current and chronic PTSD, controlled for the effect of trauma, age, smoking, alcohol consumption, physical activity and comorbid psychiatric disorders, recruited during the 2005 to 2008 period from the University Hospital Dubrava, and in age matched healthy control subjects.

2. Method

2.1. Participants and assessment

The study included ethnically uniform Croatian male participants of the Caucasian origin: war veterans with current PTSD ($N=269$), war veterans without current or lifetime PTSD ($N=209$), and healthy control subjects ($N=1553$). War veterans with PTSD met diagnostic criteria for PTSD based on the ICD-10 criteria (WHO, 1992), which is an official classification in the Croatian psychiatric practice. The assessments and ratings were conducted by psychiatrists with extensive experience in stress-related disorders, in treatment of psycho-traumatized persons and who had been trained to apply particular tests. Psychiatrists administered the Croatian version 5.0.0 of Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998) in all veterans. Groups of war veterans were assessed also by the Clinician Administered PTSD Scale (CAPS) (Weathers et al., 2001), as well as an additional psychiatric interview, routinely performed in every day clinical practice at the department.

Two control groups were established for this study. The first group consisted of non-PTSD war veterans, who participated in the war in Croatia from 1991 to 1995, but did not develop PTSD, and who were recruited consecutively among people attending the ward as part of their regular annual assessment for the physical examination in the same period as war veterans. This group was assessed with M.I.N.I. (Croatian version 5.0.0.) which excluded possible diagnosis of PTSD. Study participants in the PTSD and in the non-PTSD comparison groups were recruited as consecutive in- and out-patients admitted during the 2005 to 2008 period in the Department of Psychiatry and the Referral Centre for Stress Related Disorders of the University Hospital Dubrava, among patients who fulfilled the inclusion and exclusion criteria, and were matched on mean age, education and psychopharmacotherapy. A second control group consisted of healthy control volunteers. They did not participate in combat and were not exposed to war-related or other extreme traumas.

The exclusion criteria for all veterans were: history of prior psychotic episode, schizophrenia, dementia, mood disorders, personality disorders, substance abuse, symptoms or signs of acute or chronic physical illness, history of cardiovascular, cerebrovascular or neurological disorder, hypertension, diabetes or other metabolic or endocrine disorder. They completed a questionnaire which included: basic demographic characteristics, alcohol consumption, smoking, physical activity, dietary habits, history of diabetes, hypertension, cardiovascular and neurological diseases, presence of acute or chronic physical illness, and use of medication. In all participants weight, height, and blood pressure were recorded, and hematological and biochemical (liver enzymes: aspartate-amino transferase, alanine-amino transferase and gamma-glutamyl transferase) analyses were done.

Written informed consent was obtained from all participants, after complete description of the study, under procedures approved by the Ethics Committee of the University Hospital Dubrava, Zagreb, Croatia, and in accordance with the Declaration of Helsinki. All procedures were carried out with the adequate understanding and written consent of the subjects.

2.2. Data analysis

Statistical evaluation of the data (mean ± SD) was done using one-way analysis of variance (ANOVA). Student's t-test was used to compare two groups only. Analysis of covariance (ANCOVA) was used to test the association between BMI and the effects of PTSD (2 levels), and the presence of other psychiatric disorders (5 levels) with age, alcohol consumption and smoking as covariates, and to test overall significance of BMI differences between various subgroups. The frequency of subjects with different BMI categories, smoking habits, alcohol consumption, and physical activity, or the difference in the prevalence of other psychiatric disorders among groups was determined by a χ^2 test. The results were considered significant when $p<0.05$.

3. Results

The mean age, body mass index (BMI) and lifestyle variables in war veterans with or without PTSD are shown in Table 1. Student's t-test revealed that age ($p=0.320$) and BMI ($p=0.746$) did not differ

Table 2
Comparison of BMI between groups of veterans with and without PTSD and healthy control subjects by decade of life.

Age group	Veterans with PTSD ($N=269$)		Veterans without PTSD ($N=209$)		Healthy control subjects ($N=1553$)		One-way ANOVA	
	Mean ± SD		Mean ± SD		Mean ± SD			
	n	BMI (kg/m^2)	n	BMI (kg/m^2)	n	BMI (kg/m^2)	F	p
30–39	122	27.2 ± 3.6	97	27.1 ± 3.6	340	26.9 ± 5.0	0.228	0.796
40–49	116	28.1 ± 4.0	93	28.3 ± 3.5	524	27.5 ± 4.3	2.108	0.122
50–61	31	27.9 ± 3.8	19	28.2 ± 3.4	689	27.9 ± 4.2	0.048	0.935