Relationship between the prevalence of depressive symptoms and metabolic syndrome. Results of the SOPKARD Project

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Abstract

Introduction: Depression is a newly recognised risk factor for ischaemic heart disease (IHD). The results of many studies show that depression may contribute to the development of components of metabolic syndrome, such as arterial hypertension, obesity and glycaemic abnormalities. Thus it may have a significant impact on IHD development and worsen the course of an already established disorder.

Aim: Evaluation of the prevalence of metabolic syndrome and depression among Sopot inhabitants aged 50 or 60 years.

Methods: This study involved 795 consecutive inhabitants of Sopot (477 female and 318 male) who were invited in 2003 and 2004 to participate in screening examinations in the programme of primary prevention of arterial hypertension, diabetes and lipid abnormalities – SOPKARD. Metabolic syndrome was diagnosed according to the NCEP ATP III guidelines. Beck's Depression Inventory was used for the assessment of depressive symptoms.

Results: Metabolic syndrome was recognised in 32% of participants (in 31% of women and in 33% of men). The distribution of particular elements of metabolic syndrome was as follows: elevated blood pressure was found in 63% of subjects (female – 58%, male – 70%), abnormal fasting glucose in 24% (female – 21%, male – 28%), visceral (abdominal) obesity in 33% (female – 38%, male – 26%), elevated triglyceride level in 34% (female – 28%, male – 42%) and decreased HDL level in 26% (female – 28%, male – 23%). Symptoms of depression were found in 37% of studied subjects (42% of females, 28% of males). Metabolic syndrome was observed more frequently in subjects with depressive symptoms compared to those without depressive symptoms in the whole group (35% *vs* 28%, p <0.05) and in males (44% *vs* 28%, p <0.05). This difference was not statistically significant in females (31% *vs* 28%, ns). Visceral obesity was observed more frequently in males with depressive symptoms than in those without depressive symptoms (37% *vs* 21%, p <0.001). It was not observed in the whole group and in females. The studied females group with depression more often had a higher fasting serum glucose concentration when compared to those without depression (25% *vs* 18%, p<0.05). Such a relationship was not observed in the male group and whole group.

Conclusions: In the studied group of middle-aged subjects, especially among women, a high prevalence of depression symptoms was noted. Statistically significant correlations between the prevalence of depressive symptoms and visceral obesity in men and an elevated glucose level in women were shown.

Key words: metabolic syndrome, depressive symptoms

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Introduction

A high and still increasing prevalence of depressive disorders in the general population is a serious social and economic problem not only in Poland but also worldwide. They affect younger people more frequently, even including children, and have become a significant cause of early disability. On the one hand, depression markedly reduces the quality of life and impairs or even precludes normal social existence. On the other hand, it is one of the most frequent psychopathologies affecting patients with organic disorders. Epidemiological data suggest that approximately 20% to 33% of patients admitted by general practitioners are those with psychiatric problems, most of all depressive and anxiety disorders [1]. The approach to patients with depression should be multidimensional and interdisciplinary.

Moreover, potential metabolic consequences, typically seen in patients with depression and chronic stress as a result of neurohormonal dysfunction, are becoming an important aspect of depressive disorders. One of the current concepts considers depression as a state of chronic endogenous stress [2]. Changes within the so-called stress axis, confining the locus coeruleus and hypothalamic-pituitary-adrenal axis (HPA axis), may result in the upregulation of noradrenergic activity and disturbances of cortisol homeostasis [3]. Adverse changes in the metabolism of adrenal cortex hormones accompanying depressive syndromes may cause symptoms similar to those seen in Cushing's syndrome or during chronic corticosteroid therapy.

Disturbances may also involve the metabolism of carbohydrates and lipids, as well as haemodynamic parameters. Thus, depression can lead to metabolic syndrome and promote the formation or progression of established atherosclerotic degeneration [4]. Depressive disturbances may lead, due to atherogenic effects, to the development of ischaemic heart disease. They may also have an adverse impact on the natural history of established disorders.

The aim of this study was to assess the prevalence of metabolic syndrome and depressive symptoms in Sopot inhabitants aged 50 or 60 years.

Methods

This study comprised 795 consecutive inhabitants of Sopot, including 477 (58%) women and 318 (42%) men, who were invited in the years 2003 to 2004 to participate in a screening study being a part of the programme of primary prevention of arterial hypertension, diabetes and lipid abnormalities – SOPKARD. This community-based study involved subjects who were 50 or 60 years old at the time of their enrolment. The prevalence of metabolic syndrome was assessed according to ATP-III guidelines. Metabolic syndrome was diagnosed in patients in whom three or more of the following criteria were met: (1) high arterial blood pressure, (2) elevated fasting glucose (≥110 mg/dL and/or antidiabetic medications use), (3) visceral obesity (waist circumference >88 cm in women and >102 cm in men), (4) elevated triglyceride level (TG) (≥150 mg/dL), or (5) markedly decreased HDL concentration (<50 mg/dL in women and <40 mg/dL in men).

Beck's Depression Inventory (BDI) was employed for the evaluation of depressive symptoms (depressiveness). BDI is an international questionnaire for the assessment of intensity of depressive symptoms and monitoring of clinical depression. It is used as a screening tool for the assessment of depression in the population study. Subjects with 10 points or more according to this scale are considered to have depression.

Statistical analysis

A statistical analysis was performed using SAS version 8.2 computer software. Study hypotheses regarding potential correlations between gender, age or education and depression, as well as the evaluation of distribution of particular MS criteria in the group of patients with *vs* without depression, were verified with Chi2 test.

Results

Fifty-year-old subjects comprised 45% (48% among female and 40% male population), and 60-year-old patients – 55% (52% among women and 60% men) of the entire study population. The study group was not homogeneous with respect to their education level – 23% were elementary school graduates (18% of women and 31% of men), 46% secondary school graduates (52% women, 37% men), and 30% university graduates (30% women, 32% men).

Metabolic syndrome was diagnosed in 32% of subjects (in 31% of females and 33% of males). The distribution of elements of metabolic syndrome is outlined in Table I.

The studied group of patients featured a high prevalence of depressive symptoms (37%); they were

Table I. Distribution of components of metabolic syndrome in the studied group

Metabolic syndrome parameter	TOTAL	WOMEN	MEN
Elevated arterial blood pressure	63%	58%	70%
Elevated glucose level	24%	21%	28%
High waist circumference	33%	38%	26%
Elevated triglyceride level	34%	28%	42%
Decreased HDL level	26%	28%	23%

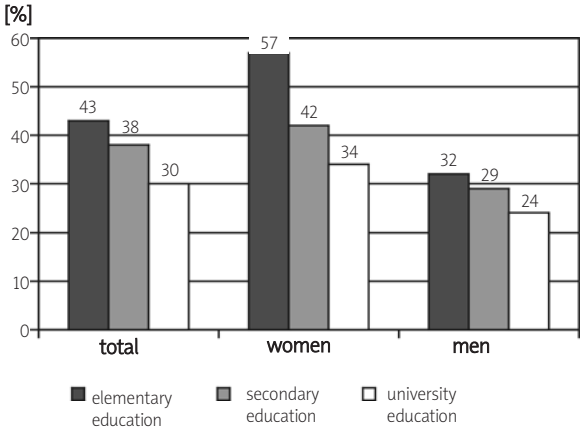

Figure 1. Distribution of depressive symptoms *vs* education

observed more often in female than in male patients (42% *vs* 28%, p<0.05). Moreover, 60-year-old women presented depressive symptoms more often than 50-year-old ones (47% *vs* 38%, p<0.05). Such differences were not found in the group of men.

Higher education was found to be negatively correlated with the prevalence of depression (Figure 1).

Metabolic syndrome was observed more frequently in subjects with depression than in those without depression in the whole group and in males (Figure 2a). Abnormal values of parameters associated with metabolic syndrome were observed more often in people presenting depressive symptoms, and their intensity was gender-dependent (Figure 2b-2f). Depressive female subjects more frequently presented higher fasting serum glucose concentration when compared to symptom-free women. Visceral obesity was more often diagnosed in depressive men than in those without depression. There were no significant differences with respect to elevated TG and decreased HDL concentrations.

Discussion

The prevalence of depressive disorders throughout life is estimated to be 16-17% in the general population in Poland [1]. In the study population the prevalence of depressive symptoms was 37%. The difference could be explained by the fact that in our study the diagnosis of depression was established only by means of Beck's Depression Inventory and was not verified by any clinical work-out.

In subjects with a clinical diagnosis of depression Beck's questionnaire is a clinical tool to monitor the dynamics of depressive symptoms. In population studies this scale is employed as a screening examination [5, 6]. A higher score in the scale indicates the presence of depressive syndrome, i.e. depressiveness. However, by employing only this scale it is not possible to perform a complete diagnostic process of depression. Moreover, this study involved only two selected groups of patients, i.e. at the age of 50 and 60 years. This is not a representative group for the general population.

In the study population, in both groups, a higher prevalence of depressive syndrome was observed in women than in men. A number of published studies regarding depression epidemiology showed similar trends. For instance, Alloy et al. have shown that depression is observed twice as frequently in female as in male patients [7]. Additionally, the authors indicate that depressive disorders are seen in all age groups of the adult population, but their frequency decreases gradually with aging. It has been shown that the prevalence of serious depressive disorders decreases parallel to the population aging [8]. In contrast, the frequency of minor, masked and organic-induced depressions gradually increases [9]. Undoubtedly, this causes diagnostic difficulties and results in the lowering of statistics regarding depression in elderly subjects. It is estimated that around 40% of cases of depression in the elderly population remain undiagnosed.

It was shown in the analysis performed herein that university education correlates with a lower prevalence of depressive symptoms. It is likely that university graduates are able to identify the main reason of their poor well-being as a psychological rather than a somatic problem more easily than those with elementary education. They also seek psychiatric or psychological assistance more often, while elementary school graduates express predominantly somatic complaints.

Many studies indicate that persons with depression are more prone to metabolic syndrome, especially visceral obesity [10, 11]. Bjorntorp indicates that depression, like other disturbances associated with chronic stress, more often leads to visceral fat accumulation and increases the risk of metabolic syndrome [12]. Moreover, the author claims that activation of the autonomic nervous system that is present in such circumstances may result in blood pressure elevation. In the study population we observed a similar phenomenon – depressive subjects had metabolic syndrome more frequently (particularly males), and there was a trend towards higher arterial pressure in subjects with depressive symptoms. In a study carried out in Germany in 2002, Weber-Hamann et al. showed that women at the perimenopausal age (50 to 60 years old) with a diagnosis of depression suffered from glucose metabolism disturbances more often [13]. Eaton et al. showed that depression could be

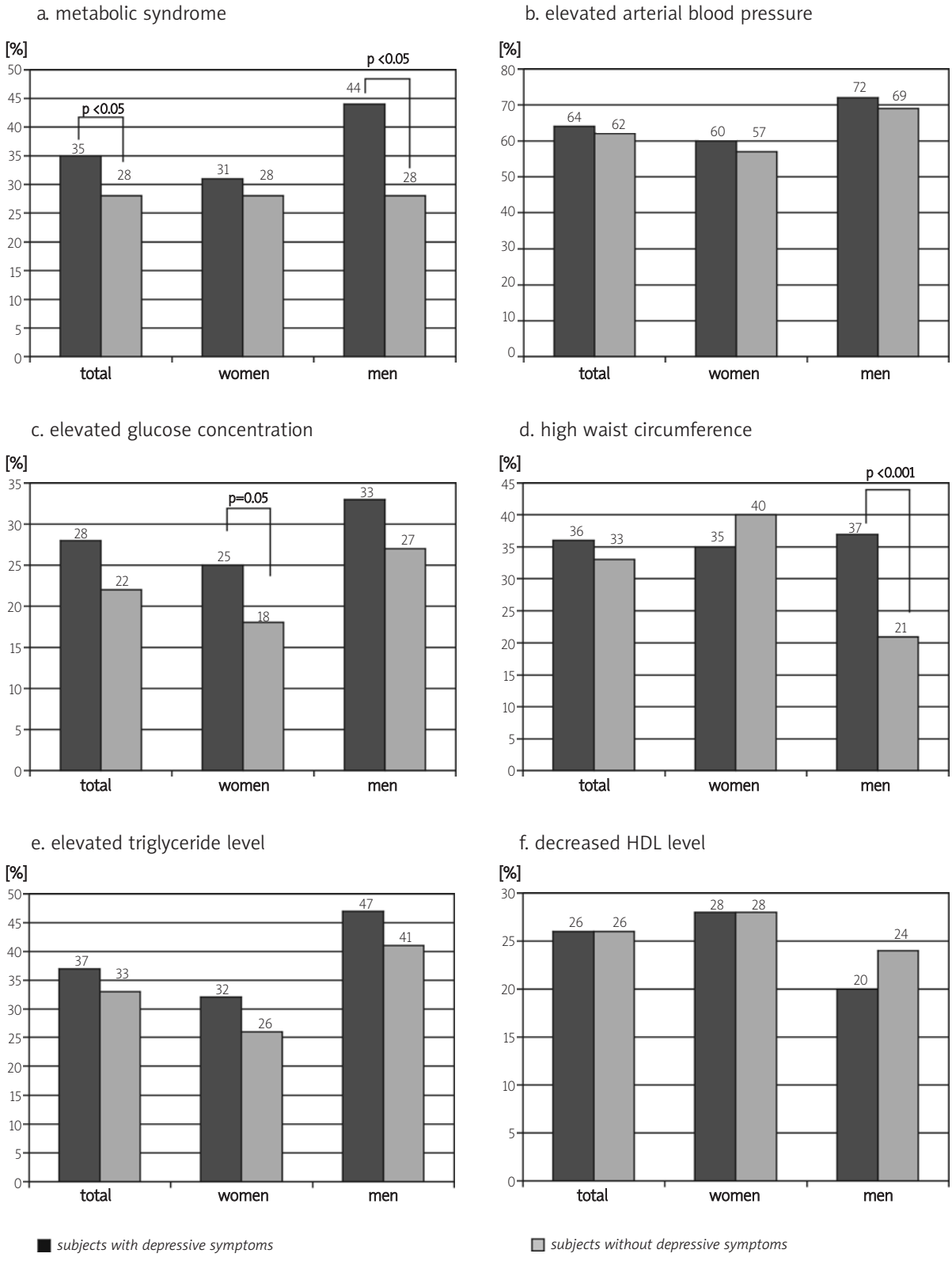

Figure 2. Compariсon of studied subgroups in the prevalence of depressive symptoms

an independent risk factor for type 2 diabetes [14]. In the group analysed herein we saw that the presence of depressive symptoms was associated with higher prevalence of elevated glucose concentration in women.

An analysis of lipid parameters has not shown any significant differences between groups of subjects with and without depression. Conclusions drawn from studies on the lipid profile in subjects with depressive disorders are inconsistent. Some of them show that patients suffering from depression have higher TG concentrations and decreased HDL levels [15, 16]. In contrast, Olusi et al. showed that people with episodes of severe depression had significantly higher HDL levels when compared to those without the disorder [17]. Significant differences between studies assessing the lipid profile in depressive disorders result from the employment of various diagnostic tools and criteria for depression and marked differences in the age of studied populations.

The question as to whether there is really a direct causal relationship between depressive disturbances and metabolic syndrome is still open. So far no analyses have provided a clear explanation of the potential pathomechanisms of this phenomenon and therefore further investigations are needed.

The results of many studies, including the SOPKARD Project, indicate that depressive symptoms may increase the prevalence of metabolic syndrome or its particular components in adults. Thus screening examinations for depression should become standard in the strategies of primary and secondary ischaemic heart disease prevention.

Conclusions

1. In the investigated group of middle-aged subjects, especially women, a high prevalence of depressive symptoms was shown, which decreased gradually in patients with higher education.
2. In the studied group significant correlation between the presence of depressive symptoms and metabolic syndrome was observed. Also correlations between the presence of depressive symptoms and particular components of metabolic syndrome – elevated fasting glucose concentrations in women and visceral obesity in men – were shown.
3. The results of the SOPKARD Project suggest a possible contribution of depressive disorders to metabolic syndrome pathogenesis.

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Związek pomiędzy występowaniem objawów depresji i zespołu metabolicznego. Wyniki programu SOPKARD

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Streszczenie

Wstęp: Depresja jest nowo poznanym czynnikiem ryzyka choroby niedokrwiennej serca (ChNS). Wyniki wielu badań pokazują, że depresja może przyczyniać się do rozwoju zaburzeń związanych z zespołem metabolicznym, takich jak nadciśnienie tętnicze, otyłość, zaburzenia glikemii. Tym samym może wpływać na rozwój ChNS i pogarszać przebieg już istniejącego zaburzenia.

Cel: Ocena częstości występowania zespołu metabolicznego i objawów depresji wśród 50- i 60-letnich mieszkańców Sopotu.

Metodyka: Badaniem objęto 795 mieszkańców Sopotu (477 kobiet i 318 mężczyzn), którzy w 2003 i 2004 r. zostali zaproszeni na badania przesiewowe w programie prewencji pierwotnej nadciśnienia tętniczego, cukrzycy i dyslipidemii SOPKARD. Zespół metaboliczny rozpoznawano zgodnie z wytycznymi NCEP ATP III. Do oceny objawów depresyjnych posłużono się skalą depresji Becka.

Wyniki: Zespół metaboliczny stwierdzono u 32% osób (31% kobiet, 33% mężczyzn). Rozpowszechnienie poszczególnych elementów zespołu metabolicznego było następujące: podwyższone ciśnienie tętnicze występowało u 63% osób (58% kobiet, 70% mężczyzn), nieprawidłowa glikemia na czczo u 24% osób (21% kobiet, 28% mężczyzn), otyłość trzewna u 33% osób (38% kobiet, 26% mężczyzn), podwyższony poziom trójglicerydów u 34% osób (28% kobiet, 42% mężczyzn), obniżony poziom HDL u 26% osób (28% kobiet, 23% mężczyzn). Objawy depresyjne występowały u 37% osób (42% kobiet, 28% mężczyzn). Zespół metaboliczny istotnie częściej obserwowano u osób z objawami depresji niż bez tych objawów – w całej badanej grupie (35% *vs* 28%, p <0.05), jak i u mężczyzn (44% *vs* 28%, p <0.05). Różnica ta nie była istotna statystycznie w grupie kobiet. Otyłość trzewną istotnie częściej obserwowano w grupie mężczyzn z objawami depresji niż bez tych objawów (37% *vs* 21%, p <0.001). Takiej różnicy nie obserwowano u kobiet i w całej badanej grupie. Kobiety z objawami depresji częściej niż kobiety bez tych objawów miały podwyższony poziom glukozy na czczo (25% *vs* 18%, p <0.05). U mężczyzn i w całej badanej grupie nie obserwowano takiej zależności.

Wnioski: W badanej grupie osób w średnim wieku, zwłaszcza u kobiet, wykazano dużą częstość występowania objawów depresji. Wykazano istotny statystycznie związek pomiędzy występowaniem objawów depresji a otyłością trzewną u mężczyzn oraz podwyższonym poziomem glukozy u kobiet.

Słowa kluczowe: zespół metaboliczny, objawy depresji

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