



Depressive symptomatology in relation to 10-year (2004–2014) acute coronary syndrome incidence; the moderating role of diet and financial status

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ABSTRACT

Background. The association between depression status and 10-year cardiovascular disease (CVD) incidence among acute coronary syndrome (ACS) patients, in relation to nutritional and financial status, was evaluated.

Methods. From October 2003 to September 2004, a sample of 2172 consecutive ACS patients from 6 Greek hospitals was enrolled. In 2013–14, the 10-year follow-up was performed. Depressive symptoms were evaluated using the validated CES-D score (range 0–60). Adherence to Mediterranean diet was assessed through MedDietScore (range 0–55) and financial status was determined by the annual income.

Results. Ranking from the 1st to 3rd CES-D tertile, recurrent fatal/non fatal ACS rates were 33%, 37% and 42%, respectively ($p = 0.006$). Multiple logistic regression models revealed an adverse association of severe depression status (i.e. 3rd tertile) compared to no depression (i.e. 1st tertile) [odds ratio (OR) = 1.31, 95% confidence interval (95% CI) 1.01, 1.69]. When controlling for financial status, the relationship between depression and ACS prognosis remained marginally significant; while subgroup analysis revealed that only patients with low/moderate income were negatively affected [OR = 1.36, 95% CI 0.98, 1.88]. Further stratified analysis, by MedDietScore group, was applied; the above association remained significant only in patients with low compliance to this dietary pattern [OR = 1.68, 95% CI 1.10, 2.18].

Conclusions. ACS coexisting with severe depression status seems to result in adverse disease outcomes while financial status and Mediterranean diet are proposed as potential moderators. Public health programs should focus on vulnerable groups and minimize depressive symptoms through appropriate medical treatment and lifestyle interventions, so as to ameliorate the disease prognosis in clinical and community levels.

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Introduction

According to the World Health Organization (WHO) proposed rank order of disease burden for 2020, ischemic heart disease and depressive symptoms are to be the two leading causes of disability, linked to higher mortality and morbidity rates (Murray & AD, 1996). Additionally, rising medical costs and increased health service utilization have been widely attributed to these morbid conditions while the psychological burden

seems to be an important driver of overall quality of life (Creed et al., 2002; Panagiotakos et al., 2008). Hence, depressive symptoms are justifiably considered as an independent cardiovascular disease (CVD) risk factor (Osby et al., 2001). Additionally, various behavioral and biological mechanisms have been proposed to interpret the association between depressive symptoms and increased cardiac incidence including acute coronary syndrome (ACS) events (Druss et al., 2000).

As far as secondary ACS prevention is concerned, even though the important role of depressive symptoms on disease prognosis has been identified for more than 40 years, only recently the focus has been oriented toward this relationship (Cay et al., 1972; Fan et al., 2014; van Melle et al., 2004). For instance, in a meta-analysis of studies with

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cardiac patients, it has been documented that, post-ACS depressive patients had almost 3-fold higher mortality risk and 2-fold higher risk of recurrent cardiac events (Meijer et al., 2011).

Mediterranean diet has been extensively studied regarding the field of cardiovascular disease, with a clear cardioprotective role, either directly or through ameliorating clinical markers in cardiac health (Panagiotakos et al., 2015; Koloverou et al., 2014; Esposito et al., 2011). The plausible interaction between this dietary pattern and depressive symptomatology has been reported in the literature proposing that compliance to the Mediterranean diet moderates the adverse impact of depressive symptoms on cardiac health (Skarupski et al., 2013). Furthermore, the coexistence of socio-economic difficulties (i.e. low income, unemployment, unpleasant marital relations) can easily lead to psychological disorders. Focusing on financial status, this has been widely reported in the literature in relation to late life depression; adults with advanced age and socio-economic difficulties are more likely to suffer from persistent depressive symptoms leading to the development of CVDs (Mojtabai & Olfson, 2004a; Notara et al., 2015).

The above parameters have been thoroughly investigated under the context of primary prevention. However, research regarding the secondary ACS prevention and the long-term interaction between depression, dietary habits and financial status, among cardiac patients is scarce. Therefore, the aim of the present study was to evaluate the association between depressive symptomatology and 10-year ACS incidence among cardiac patients in relation to lifestyle (i.e. Mediterranean diet) and socioeconomic factors (i.e. financial status), under the context of the GREECS (GREEK acute Coronary Syndromes) multi-center, longitudinal study (Pitsavos et al., 2005). The working research hypothesis was that ACS patients with major depressive symptoms were more susceptible to recurrent cardiac events with the level of adherence to Mediterranean diet and financial status interacting in the tested association.

Methods

Sampling procedure at baseline examination 2003–2004

GREECS is a prospective, observational study, established in 2003. The main goal of the study was to evaluate the annual incidence of ACS and the role of various CVD risk factors on the development and prognosis of ACS patients. From October 2003 to September 2004, $n = 2172$ consecutive patients with discharge diagnosis of ACS (i.e. acute myocardial infarction (AMI) or unstable angina (UA)) who were hospitalized in the cardiology clinics or the emergency units of 6 major general hospitals in Greece (i.e. Hippokraton Hospital in Athens and the general prefectural hospitals in Lamia, Karditsa, Halkida, Kalamata and Zakynthos island) were enrolled into the study (participation rate varied 80%–95%). The particular hospitals were selected in order to represent populations in terms of different socio-economic, cultural and regional characteristics. Of the enrolled patients, $n = 1649$ (76%) were men (65 ± 13 years) and $n = 523$ (24%) were women (62 ± 11 years) (p for age and gender differences <0.001). With the exception of Athens, where there are several other hospitals, all the other hospitals cover the whole population of the aforementioned regions, including urban and rural areas.

Medical records; defining ACS patients

At entry, as well as during hospitalization biomarkers suggesting cardiac injury and AMI such as, troponin I, creatine kinase (CK) and the MB fraction of total CK (CK-MB) were measured in all the patients. Moreover a 12-lead electrocardiogram (ECG) was performed and clinical symptoms were evaluated in all the patients, by a cardiologist. AMI was defined by typical rise and gradual fall (for troponin) or more rapid rise and fall (for CK-MB) of biochemical markers of myocardial necrosis with at least one of the following: (a) ischemic symptoms, (b) development of pathologic ST waves on the ECG, (c) ECG changes indicative of ischemia (ST segment elevation or depression), or, (d) coronary artery intervention (e.g. coronary angioplasty) (Anon, 2000). UA was defined by the occurrence of one or more angina episodes, at rest, within the preceding 48 h, corresponding to class III of the Braunwald classification (Braunwald, 1997). Medical information was retrieved through hospital records.

Measurements at baseline examination

The baseline examination included a range of patients' clinical, biochemical, socio-demographic and lifestyle characteristics. Specifically, socio-demographic and lifestyle characteristics included: age, sex, physical activity, dietary and smoking habits, years at school, financial and marital status and psychological evaluation.

Depressive symptomatology assessment

Specifically, depressive symptomatology during the past month was determined by the Center of Epidemiological Studies-Depressive symptoms (CES-D) scale (range 0–60) (Radloff, 1977). The scale has been designed to measure the level of depressive symptomatology instead of clinical diagnosis and has been validated for the Greek population (Fountoulakis et al., 2001). Because of non-available national thresholds for the studied reference population, the patients were divided in three equal size categories (tertiles): (a) 1st tertile (CES-D < 7), that represents low depressive symptoms, (b) 2nd tertile ($7 < \text{CES-D} < 20$), that represents mid symptoms and (c) 3rd tertile (CES-D > 20) that represents high symptoms. The chosen cutoff points of each tertile provide the best distribution of the sample resulting in subgroups with very close size and managing “matching” as regard the two major confounders (i.e. age, sex).

Financial status assessment

Regarding financial status, mean household annual income, during the last 3 years, was recorded through self reports. As regards people who were unemployed, the basic monthly allowance they received from the Social Service Office (in 2004) was considered to calculate annual income. Financial status was then classified as: “low” ($<9000\text{€}$), “moderate” ($<18,000\text{€}$), “good” ($<48,000\text{€}$) and “very good” ($>48,000\text{€}$), following the year 2004 tax policy. However, due to the small number of cases in the “low” and “very good” financial status groups, the categories have been merged into two categories (low/moderate & good/very good).

Dietary habit assessment

Dietary habits were evaluated using a validated Food Frequency Questionnaire (FFQ) and the level of adherence to the Mediterranean dietary pattern was assessed using the MedDietScore (range 0–55). In particular, MedDietScore evaluates the consumption of 10 food groups: non-refined cereals and products, fruits and nuts, vegetables, olive oil, non-fat or low fat dairy, fish, poultry, potatoes, pulses, red meat or meat products and eggs, as well as alcohol consumption (Panagiotakos et al., 2007). In the present study, the patients were categorized, according to MedDietScore, in 2 groups, low vs. moderate/high Mediterranean-diet adherence using the median value of the score (i.e. <27 & ≥ 27) as cutoff point (Panagiotakos et al., 2006). Higher values of this diet score indicate greater adherence to the Mediterranean diet.

Other lifestyle factor assessment

Physical activity was evaluated through a self-reported questionnaire provided by the American College of Sports Medicine (Pate et al., 1995); physical activity was defined as any engagement in activities of at least 3 times/week and for at least 30 min. Years of smoking were recorded; current smokers were defined by the protocol of the study as those who smoked at least 1 cigarette/day or have stopped smoking during the past 12 months while the rest who smoked at some time were defined as past smokers. The rest of the patients were defined as never or occasional smokers. As regards medical history, it was retrieved during the physical examination and through the patient's medical records and included the detailed assessment of hypertension, hypercholesterolemia, diabetes and any previous CVD event (i.e. prior to the baseline), as well as the pharmaceutical treatment and management of these conditions. Body mass index (BMI) was calculated as weight (in kg) divided by height (in m) squared. Obesity was defined as BMI $> 29.9 \text{ kg/m}^2$.

Further details about the aims, measurements and baseline procedures of the GREECS study may be found elsewhere (Pitsavos et al., 2005).

Follow-up evaluation

During 2013–2014, the 10-year follow-up of the patients was performed by the study's investigators. Information from $n = 1918$ of the initially enrolled

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