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Short communication

Obesity, metabolic syndrome and Mediterranean diet: Impact on depression outcome

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ABSTRACT

Objective: Obesity, metabolic syndrome (MetS) and low adherence to Mediterranean diet are frequent in major depression patients and have been separately related with prognosis. The aim of this study is to analyse their predictive power on major depression outcome, at 6 and 12 months.
Methods: 273 Major depressive patients completed the Beck Depression Inventory for depressive symptoms and the 14-item Mediterranean diet adherence score. MetS was diagnosed according to the International Diabetes Federation (IDF).
Results: At the baseline Mediterranean diet adherence was inversely associated with depressive symptoms ($p=0.007$). Depression response was more likely in those patients with normal weight ($p=0.006$) and not MetS ($p=0.013$) but it was not associated with Mediterranean diet adherence ($p=0.625$). Those patients with MetS and obesity were less likely to improve symptoms of depression than patients with obesity but not MetS.
Conclusions: Obesity and MetS, but not low adherence to the Mediterranean diet at baseline, predicted a poor outcome of depression at 12 months. Our study suggests that MetS is the key factor that impacts negatively in depression prognosis, rather than obesity or diet. If this finding is confirmed, clinicians should be aware about MetS diagnosis and treatment in overweight depressed patients, especially if outcome is not being satisfactory enough.

1. Introduction

Obesity and depression are growing as health problems in the developed world, with an estimated 350–500 million people are being globally affected with these conditions (Garcia-Toro et al., 2013; Lopresti et al., 2013). One factor that can contribute to explaining it is the population lifestyle changes (Lopresti et al., 2013). In fact, the association between depression and obesity is higher than expected by random effects (Rhee et al., 2014). Bidirectional causality between them is shown in previous studies (Luppino et al., 2010). Metabolic syndrome (MetS) is a combination of risk factors (abdominal or visceral obesity, hypertension, dyslipidemia, and glucose dysregulation) that are predictive diagnostics of coronary artery disease, metabolic diseases and certain cancers (Kahl et al., 2013). In both obesity and depression, MetS is highly prevalent and several studies have suggested that there is a bidirectional relationship between depression and MetS (Marazziti et al., 2014). Diet is a lifestyle key factor that could have influence on the onset of obesity, depression and MetS (Lopresti et al., 2013; Garcia-Toro et al., 2012). Evidence suggests that high adherence to the Mediterranean diet seems to have a favourable effect in preventing and treating depression in both MetS and obesity (Martínez-González et al., 2015; Garcia-Toro et al., 2014).

Diet, obesity and MetS are associated to subsequent incidence of depression (Preiss et al., 2013). A poor diet, obesity and MetS predispose to metabolic changes that interacts with brain function and psychopathology through very complex mechanisms, and probably with individualised effects for each patient (Mansur et al., 2015). Thus, the glucose and insulin homoeostasis, the

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sympathoadrenal and the immune-inflammatory axis, all are key mechanisms that altered involved in oxidative stress and monoamine alterations, leptin and insulin resistance and BDNF and HPA dysregulations (Mansur et al., 2015). Persistence in dysregulation of all these mechanisms has been linked to poor outcome of depression (Yoshimura et al., 2009).

Obesity has been related to treatment resistance in depression (Uher et al., 2009). MetS and a poor-quality diet have been also associated with a worst depression outcome (Jacka et al., 2015). To our knowledge, there is no longitudinal study that examines these three factors simultaneously in depression outcome. This is a very important point given its high interrelation, in order to compare them and clarify their relative contribution.

The purpose of the present study is to analyse the predictive impact of obesity, MetS and Mediterranean diet adherence on major depression outcome, at 6 and 12 months. The hypothesis is that obesity, MetS and low adherence to the Mediterranean diet at baseline will predict a poor outcome of depression at 12 months.

2. Methods

The study was approved by the Ethic and Clinical Research Committees of three Spanish regions (Balearic Islands, Catalonia and Aragon). A detailed research protocol has been registered (ISRCTN73931675) and published elsewhere (Garcia-Toro et al., 2014). Study participants were patients, aged 18 or more, with diagnosis of major depressive disorder as stated by the DSM-IV-TR, mild to moderate depressive symptoms for at least two months of duration who participated in a previous, multi-centre, cluster-randomized controlled trial, aimed to analyse the effectiveness of four structured hygienic-dietary recommendations in depression outcome (Serrano Ripoll et al., 2015). A total of 62 General Practitioners participated in the study and included 273 patients from primary health centres.

2.1. Measurements

Major depression was diagnosed using the Mini International Neuropsychiatric Interview (MINI). Depression severity was measured by the validated Spanish version of the Beck Depression Inventory (BDI-II). This instrument is widely used as it allows patients to self-score for depressive symptoms, avoiding evaluation bias, and determines a cut-off for mild or moderate depression. More than a 50% decrement for basal BDI and 12 month BDI was considered depression response.

Mediterranean diet was measured by a 14-item Mediterranean diet adherence score (MEDAS). The total score was categorized in two groups: <7 points (low adherence) and ≥ 7 points (high/medium adherence). Metabolic syndrome was diagnosed using the IDF criteria (Garcia-Toro et al., 2014).

All outcome variables were assessed 3 times: prior to the start of the study (baseline), after 6 and 12 months after inclusion (first and second follow-up respectively) in individual and face-to-face data collection.

3. Statistical analyses

Analyses were performed using SPSS version 21.0. Participants were categorized by sex to illustrate any difference between these groups, using Chi-square and *t*-Student tests, as appropriate. The main analysis examined the associations between MetS and BMI as categorical variables and BDI at 12-month as a continuous variable using general linear models.

4. Results

4.1. Descriptive

82% of the patients sampled were women, with an average of 51 years, one-third of patient were obese (BMI > 30). Seventy seven (28.3%) of the patients meet criteria for MetS.

At baseline MEDAS score was inverse and significantly associated with BDI score. Patients who were consuming less than 3 portions of fruits, one or more portions of butter, or soda drinks a day were significantly associated with higher basal BDI score. However, consuming more poultry meats than red meats was inversely associated with basal BDI score (Table 1).

4.2. Bivariate associations between depression response, diet, obesity and MetS

Response to depression was more likely in those patients with normal weight and not MetS but it was not associated with MEDAS score (Table 1). Although those patients were consuming nuts, at least once a week generating a tendency of response relatively ($p=0.063$) higher.

4.3. General linear models

We fit three stages of general linear model to the data to examine the contribution of obesity and MetS and potentially confounding variables to depression recovery measured at 12 month of follow-up. Models 1 and 2 showed a positive association between obesity, MetS and 12-month BDI differences adjusted by sex and age. Notably, when we introduced both terms in model 3, overweight adjusted by MetS change the direction of the association from positive to negative.

In order to further explore the potentially combined effect of obesity and MetS in depression recovery, patients were categorized in three groups: (1) no obesity and no MetS; (2) obesity and no MetS; (3) obesity and MetS. Those patients with MetS and obesity were less likely to improve symptoms of depression at 6 and 12 month of follow-up (Fig. 1).

5. Discussion

Our results indicated that both obesity and MetS predict a worst outcome of depression. Patients with comorbid obesity and MetS at baseline are clearly the most associated to a poorer depression prognosis one year later. Depression outcome of obesity without MetS patients is no different than no obesity and no MetS patients. Low adherence to the Mediterranean diet does not worsen depression prognosis at one year follow-up.

Obesity and depression are growing major public health concern and MetS could be a key mediator factor (Mansur et al., 2015). MetS has been linked to inflammatory processes and organism oxidative stress. These processes have been also described in depression (Maes et al., 2009). Moreover, the persistence of oxidative and inflammatory dysregulation has been linked to the risk of chronic depression (Yoshimura et al., 2009). Therefore, for depression improvement is important to ameliorate inflammatory and oxidative dysregulation (Lopresti et al., 2013). This leads to argue that, in addition to prescribing the most complete and energetic antidepressant treatment, it could be helpful to detect and treat MetS cases to improve depression prognosis. For instance, one option could be through interventions that would improve the quality of diets facilitating weight loss. Up to now, these programs were considered unviable because the interventions were potentially stressful in depressed patients (Serrano Ripoll et al., 2015);