Author's response to reviews

Title: Association between dietary patterns and metabolic syndrome in a sample of Portuguese adults.

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Author's response to reviews: see over
20 June 12

Dear Editor of Nutrition Journal,

Please, find enclosed the revised manuscript entitled "Association between Dietary Patterns and Metabolic Syndrome", authored by Maria João Fonseca, Rita Gaio, Carla Lopes, and Ana Cristina Santos, for publication in Nutrition Journal. We appreciated all the comments to the manuscript and the changes made are described below.

Reviewer 1

Major compulsory Revisions:

1. As suggested by the Reviewer, we added in “Portuguese population” in the abstract.

2. We rewrote the 2nd paragraph of “Background” according to the Reviewer comment. The Reviewer is of course correct when stating that a relative amount of papers have been published that considered a posteriori pattern definition. However, most of the statistical methods that have been used for the construction of DPs involve factor or principal component analysis, thus exploring the correlations among food groups and/or combinatorial algorithms of cluster analysis, hence minimizing some predefined cluster criterion. Within these methods and with the purpose of evaluation of diet–disease relationships, it has been advocated that a two-step procedure computing covariate-adjusted food consumption residuals before the cluster construction should be followed (Jakes RW, Day NE, Luben R, Welch A, Bingham S, Mitchell J, Hennings S, Rennie K, Wareham N. Adjusting for energy intake—what measure to use in nutritional epidemiological studies? International Journal of Epidemiology 2004; 33:1382–1386.). This is to ensure that the relationships are specific and not a reflection of a more general association with total quantity of food consumed. Covariates should include total energy intake and may also consist of other descriptive variables such as age, body weight or body mass index. Recent studies suggested the use of finite mixture models for the identification of eating habits. In these models, data are viewed as coming from a mixture of probability densities, each representing a different cluster, and, if necessary, both the mixing proportions and the probability densities can be conditioned on covariates of interest.
3. There are several methods for constructing clusters, even within the hierarchical and non-hierarchical procedures. The determination of the ideal clustering method to use is, most of the times, empirical and based on expert's interpretation of the results. Statistically, there is not yet a measure for model selection within the algorithmic approaches of clustering that collects universal consensus. Factor or principal analysis and K-means (and also the Ward method) have been the most applied methods, may be due to its model simplicity and ease of application (Newby PK. Empirically derived eating patterns using factor or cluster analysis: a review. Nutrition Reviews 2004;62(5):177–203). The use of finite mixture models has been the most recent methodology proposed for model-based clustering (Fahey MT, Thane CW, Bramwell GD, Coward WA. Conditional Gaussian mixture modelling for dietary pattern analysis. Journal of the Royal Statistical Society 2007;170(1):149-66.), and one can even go beyond the standard models (Gaio et al, A restricted mixture model for dietary patterns analysis in small samples, to appear in Statistics in Medicine). Mixture modelling brings several advantages over the previous approaches: it allows problems such as the choice of the number of clusters and of the clustering method to be recast as statistical model choice problems; it produces posterior cluster membership probabilities for each subject, given individual food intakes and any other relevant variables, therefore providing measures of uncertainty of the associated classification; it allows for food consumption covariates adjustment simultaneously with the fitting process, instead of the usual two-step procedure from factor analysis mentioned earlier; it allows for pattern prevalence to depend on a set of (concomitant) variables, which avoids biases in the usual three-step procedure given by the following: finite mixture modelling (with no covariates) \(\rightarrow\) classification of individuals based on posterior probabilities \(\rightarrow\) multinomial regression analysis relating classes to covariates (Muthén BO, Beyond SEM. General latent variable modeling. Behaviourmetrika 2002; 29:81–117); if different food group variances are permitted, it becomes scale invariant and thus makes variable standardization redundant; it allows for correlated measurement errors between some or all food groups by suitable parameterizations of the covariance matrix.

4. Some parts of the “Discussion” were moved to the “Introduction”, and we rearrange the “Discussion” section, according to the suggestions. Now, we first start to summary our key findings, and then we describe studies that evaluated the relationship between DPs and MetS,
comparing their results with ours. Finally, we commented on strengths and limitations of our work and ended with the conclusion.

5. The 2nd paragraph of the “Background” was rewritten.

6. We rearranged the methods section and added the subheadings as suggested: “Definition of MetS”, “Dietary pattern analysis”, and “Other statistical analysis”.

7. We argued that including participants who had been previously diagnosed with MetS or its features might have weakened the association, because those participants could have changed their diet to a healthier one. However, we do not have information about previous diagnosis of MetS or its features. We defined MetS and its features according to the most recent proposed definition, based on blood samples collected at the time of interview and anthropometric measures.

8. The manuscript was reviewed, regarding the English and flow.

9. We replace “female” and “male” by “women” and “men”, respectively, in the whole document.

Reviewer 2

1. We added in the abstract the city and the date of data collection. Regarding the Reviewer’s comment on the practical relevance of our results, we chose not to include this in our conclusion, due to the cross-sectional nature of our data. Stating that these results might have some impact on the clinical management of metabolic syndrome seems abusive. However, if the Reviewer finds this fundamental, we may modify this accordingly.

2. We rephrased the sentence suggested: “Also, it is uncertain whether the observed association reports the effect of a single food or nutrient, or if the food or nutrient act as an indicator of an overall lifestyle and DP”, for “Also, it is uncertain whether the observed association actually reports the specific effect of the nutrient intake, or if it acts as an indicator of an overall lifestyle”. We wanted to illustrate that in the single-nutrient approach, one cannot be sure if the effect is due to the specific nutrient or if it is due to the lifestyle or DP associated with the intake of that specific nutrient. We hope it is clearer now.

3. Our sample was composed by non-institutionalised inhabitants of Porto selected by random digit dialling. However, there were some differences between our sample and the population of Porto: in our sample there were 61.4% of women and 38.6% of men, while in Porto population there is 55.7% of women and 44.3% of men. So, our sample had more women than it was
expected. Also, our sample was older than the population of Porto. However, we know from a previous study, that this fact did not influence the direction or the magnitude of myocardial infarction risk estimates (Ramos E, Lopes C, Barros H. Investigating the effect of nonparticipation using a population-based case-control study on myocardial infarction. Ann Epidemiol2004 Jul;14(6):437-41.). So, we expected that the association between MetS and DPs was not influenced by these differences

4. and 5. We have performed the suggested amendments regarding the references.

Reviewer 3
Major comments
1. There is no concept such as significant differences amongst the dietary patterns themselves. There can be significant differences amongst the (eg, mean of the) variables that entered the clustering construction. Regarding that point, please consult the table at the end of the document (Oliveira A, Rodriguez-Artalejo F, Gaio R, Santos AC, Ramos E, Lopes C. Major habitual dietary patterns are associated with acute myocardial infarction and cardiovascular risk markers in a southern European population. J Am Diet Assoc2011 Feb;111(2):241-50.).

2. The women with the “in transition to fast-food” DP are the ones with the higher intake of sweets and fast-food, and also of white meat. These DP were previously described and named, and were already published. The description of the differences in the intake of the food groups are illustrated in the table at the end of the document (Oliveira A, Rodriguez-Artalejo F, Gaio R, Santos AC, Ramos E, Lopes C. Major habitual dietary patterns are associated with acute myocardial infarction and cardiovascular risk markers in a southern European population. J Am Diet Assoc2011 Feb;111(2):241-50.). Also a paragraph was added with a brief description of each DP in the Results section.

3. In our sample, the BMI mean and median were high (26.7 and 26.2 overall, respectively) and the prevalence of overweight and obesity were also high (40.4% and 21.3% overall, respectively). However, this is in accordance with previous studies that evaluated the prevalence of overweight and obesity in Portugal, which was 39.4% and 14.2%, respectively in a nationwide representative study of obesity, performed between 2003 and 2005 (do Carmo I, Dos Santos O, Camolas J, Vieira J, Carreira M, Medina L, Reis L, Myatt J, Galvao-Teles A.

4. The “high” and “low” terms presented in table 3 and 4 are defined in the “Participants and Methods” section, in the subsection “Definition of MetS”. These terms are usually used when referring to the MetS features. Nonetheless, the cut-points used for waist circumference, blood pressure, blood lipids and glucose are stated in the text. We chose not to repeat this information in the table, but if the Reviewer thinks it preferable, the table will be changed accordingly.

5. We adjusted the models for age, daily energy intake, education, physical activity, smoking, alcohol drinking, BMI, and menopausal status, because these variables are potential confounders since they were related with the exposure (dietary patterns) and the outcomes (MetS and its features). We added that explanation in the “Participants and Methods” section, in the subsection “Other analysis”.

Minor comments:

1. The reviewer was correct, and we are sorry for the discrepancy. The corrected numbers are those presented in the tables, so we changed accordingly.

2. Reference style is now fully in accordance with the Instructions for Authors.

3. The year of publication was added in the reference 14.

Yours sincerely,

Maria João Fonseca
Table 1. Characterization of the identified dietary patterns (DP) according to mean consumptions of each food-group.

<table>
<thead>
<tr>
<th>Food groups (g/day)</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean (SD)</td>
<td>mean (SD)</td>
</tr>
<tr>
<td><strong>DP 1</strong></td>
<td><strong>DP 2</strong></td>
<td><strong>DP 3</strong></td>
</tr>
<tr>
<td>Red meat</td>
<td>40 (33.7)</td>
<td>61 (71.1)</td>
</tr>
<tr>
<td>White meat</td>
<td>38 (31.2)</td>
<td>31 (31.8)</td>
</tr>
<tr>
<td>Fish</td>
<td>72 (37.4)</td>
<td>67 (46.8)</td>
</tr>
<tr>
<td>Vegetables</td>
<td>205 (128.5)</td>
<td>124 (102.6)</td>
</tr>
<tr>
<td>Fruits</td>
<td>339 (164.3)</td>
<td>226 (219.4)</td>
</tr>
<tr>
<td>Pasta/potatoes/rice</td>
<td>133 (66.9)</td>
<td>133 (87.2)</td>
</tr>
<tr>
<td>Dairy products</td>
<td>501 (259.4)</td>
<td>304 (294.7)</td>
</tr>
<tr>
<td>Vegetable soup</td>
<td>370 (161.7)</td>
<td>203 (215.8)</td>
</tr>
<tr>
<td>Cereals</td>
<td>137 (65.2)</td>
<td>117 (90.2)</td>
</tr>
<tr>
<td>Added fats</td>
<td>12 (9.5)</td>
<td>11 (9.6)</td>
</tr>
<tr>
<td>Sweets</td>
<td>21 (30.9)</td>
<td>35 (61.2)</td>
</tr>
<tr>
<td>Fast-foods</td>
<td>11 (16.2)</td>
<td>40 (56.6)</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>53 (117.9)</td>
<td>107 (248.2)</td>
</tr>
<tr>
<td>Alcoholic beverages</td>
<td>64 (113.9)</td>
<td>91 (167.5)</td>
</tr>
</tbody>
</table>

Boldface and underline represent, respectively, the highest and lowest mean consumptions, across clusters and by sex, which have shown to be significantly different from the remaining mean consumptions, by performing multiple comparison tests.

SD: standard deviation