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A prospective study of mental health status in morbidly obese patients.

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INTRODUCTION

AIM: To determine if co-morbidities have an effect on mood in a cohort of morbidly obese patients.

BACKGROUND

• A significant proportion of adults diagnosed with type 2 diabetes will also have concomitant obesity, commonly defined as people with a body mass index (BMI) of ≥30 (Gregg et al. 2007).

• This combination of concomitant risk (obesity and type 2 diabetes) has been termed by some clinicians as the ‘diabesity’ epidemic (Zimmitt 2007, Bailey 2005).

• Current research and evidence-based practice guidelines offer a range of treatments and care pathways for reducing obesity - type 2 diabetes.

• Prior research in the morbidly obese (selected) has examined mental health status and coping mechanisms related to functionality (Arentz et al. 2014), personal factors associated with GQOL (Landel et al. 2011) and the relationship of mood to health related quality of life measures (Anderson et al. 2012). However none of these studies have examined associations of mental health indicators in relation to the presence of type 2 diabetes.

METHODS

• Sequential linear regression analysis conducted on health and demographic data, using two validated anxiety/depression scales combined (Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder (GAD-7)) as the primary outcome.

• Demographic characteristics (body mass index [BMI] age and gender) was recorded on patients. The presence or absence of various co-morbidities - hypertension, sleep apnoea, diabetes, ischaemic heart disease (IHD), arthritis, anxiety/depression, COPD/asthma and hypothyroidism - was also recorded for all patients.

• Individual and summed item scores on the PHQ-9 and GAD-7 instruments were also recorded. With the key outcome variables considered to be the summed scale scores.

• The sampling was summarised descriptively. The extent of missing data, and its suitability for imputation, was assessed before imputation. Cases with extensive missing data were deleted from the data set before further analysis.

• The correlation of level of agreement between the PHQ-9 and GAD-7 summed scale scores was assessed. As both these measures comprised similarly worded outcomes, with identical response options and option scoring, it was considered appropriate to derive a composite measure from the two scales for use in a subsequent regression analysis, subject to findings of high correlation and good consistency between the scales.

• The impact of demographic characteristics and co-morbidities was assessed on the combined outcome measure using a sequential modelling strategy, using 2 blocks; comprising respectively all co-morbidity variables (Block 1) and all demographic variables (Block 2). Within Block 1, a backward elimination modelling strategy was utilised to derive a parsimonious subset of variables to be considered in conjunction with demographic variables, all of which, being of greater clinical interest, were forced into the model in Block 2. Standard regression statistics for the final model were reported.

• Regression assumptions were checked using residual plots. Standardised residuals, leverage values and Cook’s distances were calculated for all data points to check for the presence of values exerting an undue influence on the regression model.

• There is no evidence for violation of model assumptions or of any individual data point exerting undue influence on the model.

RESULTS

• Outcome data was collected on 464 patients. No demographic or co-morbidities data was collected on 54 patients. These patients were deleted from further analysis, leaving 410 patients for analysis. About 0.1% of data on the remaining cases was missing, with complete information available from 406 cases. Imputation was not conducted on the missing data.

• Seventy nine patients (19.4%) had no reported co-morbidities. About half of all patients (211; 51.4%) had 1 or 2 reported co-morbidities. The number of reported co-morbidities varied with age; with older patients being more likely to report more co-morbidities (p<0.001). Many reported more co-morbidities than women (mean number of co-morbidities reported by women=1.74 (SD=1.93), mean number of co-morbidities reported by men=1.42 (SD=1.32). There was no relationship between BMI and number of reported co-morbidities; or between any of the reported demographic variables and either outcome score. The sample is summarised descriptively in Table 1.

• The outcome measures of PHQ-9 and GAD-7 were found to be strongly and significantly correlated (r=0.822; p<0.001). The extent of the correlation suggested that a multivariate analysis or independent regression analyses should be conducted on the separate scale scores would be of limited benefit; furthermore, independent regression analyses could lead to inflated family-wise error rates. hence analysis was conducted on a combined outcome.

• A Bland-Altman plot derived from the two sets of standardised scores (Figure 1) illustrated good levels of agreement between the scales, with no obvious relationship between agreement level and scale scores. Hence a simple composite measure comprising the unweighted total of item scores was derived for use in a subsequent regression analysis.

• The sequential regression analysis conducted on the combined outcome measure resulted in variables corresponding to patient anxiety/depression and arthritis being carried forward from Block 1 of the sequential regression analysis for inclusion in the final model alongside the demographic variables. In this model, occurrence of arthritis and occurrence of anxiety/depression were both statistically significant at the 5% significance level (p=0.049 for occurrence of arthritis; p<0.001 for occurrence of anxiety/depression), with the presence of both conditions being associated with worse functionality.

• Age appeared to show some substantive association with the outcome (p=0.059); the negative parameter coefficient implies that functionality increases with increasing age (for both of the individual scales, and the combined scale, higher scores indicate lower functionality). BMI and gender did not exhibit any relationship with the outcome measure; with increasing age being associated with slightly improved functionality.

• The adjusted-PP statistic for this model was 0.757, indicating that the model is a fairly good fit to the data.

• Examination of a plot of standardised residuals against standardised predicted values revealed no violations of regression assumptions (Figure 2).

• The largest absolute value of the standardised residual was found to be 2.13, well within expectations for a data set of this size. The largest value recorded for any data point was 0.049, about the limit of expectations for a data set of this size. However, the largest value of Cook’s distance recorded for any data point was 0.018, suggesting that no individual data point exerted undue influence on the model.

Table 1: descriptive summary of sample (n=410)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (valid %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male 214 (51.7)</td>
</tr>
<tr>
<td></td>
<td>Female 200 (48.3)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Yes 176 (42.9)</td>
</tr>
<tr>
<td></td>
<td>No 234 (57.1)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>Yes 112 (27.2)</td>
</tr>
<tr>
<td></td>
<td>No 304 (72.8)</td>
</tr>
<tr>
<td>BMI</td>
<td>Yes 232 (56.6)</td>
</tr>
<tr>
<td></td>
<td>No 178 (43.4)</td>
</tr>
<tr>
<td>COPD/asthma</td>
<td>Yes 201 (48.9)</td>
</tr>
<tr>
<td></td>
<td>No 209 (51.1)</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>Yes 117 (28.7)</td>
</tr>
<tr>
<td></td>
<td>No 293 (71.3)</td>
</tr>
<tr>
<td>Numerical variable</td>
<td>Male 218 (52.7)</td>
</tr>
<tr>
<td></td>
<td>Female 192 (47.3)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>47.3 (12.7)</td>
</tr>
</tbody>
</table>

Table 2: P-values, parameter estimates and confidence intervals: combined PHQ9/GAD7, outcome

<table>
<thead>
<tr>
<th>Variable</th>
<th>p-value</th>
<th>Parameter estimate</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>0.048</td>
<td>0.15</td>
<td>(0.007, 0.30)</td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td>0.065</td>
<td>0.11</td>
<td>(0.001, 0.22)</td>
</tr>
<tr>
<td>BMI</td>
<td>0.117</td>
<td>0.10</td>
<td>(0.006, 0.21)</td>
</tr>
<tr>
<td>Age</td>
<td>0.068</td>
<td>-0.09</td>
<td>(-0.004, 0.068)</td>
</tr>
</tbody>
</table>

Figure 1: Bland-Altman plot for agreement between PHQ9 and GAD7 outcomes

CONCLUSIONS

• PHQ9 and GAD7 scales are closely correlated and show good agreement with each other. Hence analysis was conducted on a single outcome measure combined from both of these scales.

• There is insufficient evidence to conclude that either BMI or gender affects scores measured on the combined PHQ9/GAD7 outcome.

• Some substantive association (non-significant) appears to exist between age and combined scale scores; with older patients reporting slightly better functionality.

• Of the various co-morbidities reported by patients, arthritis and, particularly, reported anxiety/depression have the greatest effect on combined scale scores. The presence of both these conditions is associated with lower functionality.

• There is no evidence that the presence of any other co-morbidity affects the combined scale scores.

• There is no evidence for violation of model assumptions or of any individual data point exerting undue influence on the model.

REFERENCES


