

## Short report

## Obesity in individuals with schizophrenia: a case controlled study in Scotland

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**Background**

Despite extensive clinical concern about rates of obesity in patients with schizophrenia, there is little evidence of the extent of this problem at a population level.

**Aims**

To estimate levels of obesity in a national population sample by comparing patients with schizophrenia with matched controls.

**Method**

We calculated levels of obesity for each patient with schizophrenia from the national Primary Care Clinical Informatics Unit database (n=4658) matched with age, gender and neighbourhood controls.

**Results**

We demonstrated a significant increased obesity hazard for the schizophrenia group using Cox regression analysis, with odds ratio (OR) of 1.94

(95% CI 1.81–2.10) (under the assumption of missing body mass index (BMI) indicating non-obesity) and OR=1.68 (95% CI 1.55–1.81) where no assumptions were made for missing BMI data.

**Conclusions**

People with schizophrenia are at increased risk of being obese compared with controls matched by age, gender and practice attended. Priority should be given to research which aims to reduce weight and increase activity in those with schizophrenia.

**Declaration of interest**

None.

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Schizophrenia is a chronic illness associated with significant and long-lasting health, social and financial burden for patients, their families, other caregivers and the wider society.<sup>1</sup> There is a well-recognised increase in morbidity and mortality, and life expectancy may be reduced by 20%.<sup>2</sup> A significant part of this burden relates to comorbid poor physical health.<sup>3</sup> The prevalence of obesity in schizophrenia has been cited as 1.5 to 4 times higher than the general population.<sup>4–6</sup> However, there is little evidence of this at a population level. We aimed to provide an estimate of the levels of obesity in a large national population sample by comparing cases matched with age, gender and neighbourhood controls.

**Method****Design**

Descriptive and analytical comparison of target population with matched controls.

Data were obtained from the Primary Care Clinical Informatics Unit (PCCIU) data-set. Please see <http://www.abdn.ac.uk/iahs/research/primary-care/pcciu/data.php> for details of the data collected in this data-set, the methods they have used and the limitations the set may contain.

Since this was the analysis of an anonymised data-set, ethical approval to conduct the study was not required.

**Inclusions**

Adults (aged 16–65 years) registered within any of the 379 practices contributing to the PCCIU combined database from 2007 to 2011 with a diagnosis of schizophrenia or with any of the following sub-coded diagnoses of schizophrenia: simple, hebephrenic, catatonic, paranoid, acute episode, latent, residual or others. In

Scotland, initial diagnoses of schizophrenia are made by the secondary care psychiatric team using the ICD-10.<sup>7</sup> Four randomly selected control patients matched on age (12 months younger or older), gender and practice were identified.<sup>8</sup>

**Exclusions**

Children (<16 years) at time of schizophrenia diagnosis. In Scottish primary care, adulthood is recognised from age 16 years.

**Data**

For all patients we accessed the latest body mass index (BMI) recorded after 2007, including the date recorded, using the standard PCCIU process for determining BMI. Where no BMI was recorded, we requested patients' heights, weights and the dates these were recorded, if recorded within the 3 years before entry into the PCCIU database, in order to calculate BMI where possible. Patients with a recorded BMI were classified as obese (BMI  $\geq 30$  kg/m<sup>2</sup>) or not obese (BMI <30 kg/m<sup>2</sup>). We followed two different methods for dealing with data where no BMI, height and weight were recorded in the 3 years before entry into the PCCIU database. In the first investigation, these records were classified as not obese following the logic that as there was no weight or BMI recorded the GP saw no clinical need to obtain these measures. In a second investigation, we excluded records where BMI was not recorded or calculable. For descriptive purposes and to ensure a matched sample, we identified the age, gender and practice code for all cases and controls.

**Analysis**

Descriptive statistics were reported as means and standard deviations or counts and percentages as appropriate. Rates of obesity

**Table 1** Obesity in patients with schizophrenia versus controls by age categories (analysis under parsimonious assumption where missing body mass index (BMI) is treated as missing)

Age, years	Obese with schizophrenia diagnosis N (%)	Obese controls <sup>a</sup> N (%)	Cox regression hazard OR (95% CI)	$\chi^2$ P
16–29	134 (31.4)	279 (11.9)	2.98 (2.20–4.04)	<0.001
30–49	813 (35.9)	1951 (24.6)	1.72 (1.54–1.93)	<0.001
50–65	525 (37.6)	1613 (33.3)	1.23 (1.08–1.40)	0.002

a. Where missing BMI data were treated as 'not obese'.

were compared between cases and controls using  $\chi^2$  test. We used a Cox proportional hazards regression model to estimate the odds of obesity among cases versus controls for all and across three broad age categories at the time of BMI recording (16–29, 30–49 and 50–65 years). Data were analysed using SPSS Version 24.

## Results

The PCCIU database yielded 4941 cases and 19752 controls matched by age, gender and practice. Cases of schizophrenia, where BMI was only recorded or could be calculated prior to diagnosis, were excluded ( $n=281$ ). Following clinical guidance, cases and controls were excluded where the recorded BMI was  $\leq 14$  or  $\geq 60$  as this was deemed to be an unreliable recording ( $n=16$ ). Finally, cases and controls were excluded if aged  $< 16$  years on the date of BMI. This left a total sample of 24 344 (4658 cases, 19 686 controls). Mean age of cases was 44.7 years (s.d.=10.83) and for controls it was 43.23 years (s.d.=11.63). A total of 3109 cases (66.7%) were male and 13 154 controls were male (66.8%). A total of 1472 cases (31.6%) were categorised as obese compared with 3843 (19.5%) controls ( $\chi^2$   $P<0.001$ ) (where missing BMI data were treated as 'not obese'). Under this assumption, there was an increased obesity hazard if diagnosis of schizophrenia was present, odds ratio (OR)=1.94 (95% CI=1.81–2.10). Under the assumption where missing BMI data were treated as 'missing', obese cases remain as 1472 (but as 36%) compared with 3843 (25.4%) controls ( $\chi^2$   $P<0.001$ ). Under this assumption, there was an increased obesity hazard if diagnosis of schizophrenia was present, OR=1.68 (95% CI=1.55–1.81). We were unable to conduct analysis within age categories under the first assumption that missing BMIs were treated as 'not obese'. This was due to BMI and 'age at BMI' having similar missing data with extensive overlap. However, analysis was possible under the second assumption where missing BMI data were treated as missing. Table 1 presents odds of obesity within age categories for these analyses.

## Discussion

Using a large database representative of the Scottish population, we found that people with a diagnosis of schizophrenia have an increased hazard of being obese when compared with adults matched by age, gender and practice attended. Our analyses show that even within a nation with a substantial obesity prevalence, patients with schizophrenia are significantly more likely to be obese. Furthermore, the difference in rates of obesity is greater between the schizophrenia and control groups across all three age categories with the differences being greater with younger age.

Our data are drawn from the PCCIU database which draws data from 379 participating practices and approximately 1 million patients. Thus, these results provide strong evidence of the national scale of the obesity problem for patients with schizophrenia which, when coupled with findings that people with schizophrenia are

significantly more sedentary than the general population,<sup>9</sup> highlight the necessity for future research and funding into interventions to address the problem. The importance of this has also been identified by a Cochrane review of interventions to address weight gain in patients with schizophrenia<sup>10</sup> and a recent editorial discussing the need for evidence-based interventions that increase physical activity in order to improve health and reduce premature mortality in people with schizophrenia.<sup>11</sup> Our data suggest that such interventions would be worth targeting patients with schizophrenia in early adulthood.

Although we endeavoured to conduct as comprehensive an examination of the available data as was possible, there are still several limitations which may have affected our results. We could not control for potentially inaccurate recordings within the PCCIU data-set, save exclude suspect cases; however, we did make some assumptions regarding which data to examine. In the first assumption, we considered that the lack of a recorded BMI for a study control indicates the likelihood of them not being obese. We considered this to be the most logical approach to consider the missing data to be a likely indication that general practitioners did not take such measurements as they had not perceived a risk of obesity. However, we could not be certain of this. So we included a further analysis where we excluded controls without a registered BMI. Under such an assumption, we sought to avoid an underestimate of the risk, particularly given the obesity levels across Scotland as a whole. A further potential limitation to our findings may result from the assumption that obtaining controls from the same general practice catchment areas as cases would result in representativeness in terms of other important factors such as deprivation status. Practice controls can only be considered representative of the general distribution of the practice population involved which as a group may well be diverse.<sup>12</sup>

In spite of the enormous potential personal and health costs involved, there is to date an insufficient evidence base to guide clinicians towards the adoption of effective interventions to address obesity for their patients' benefit. Given the very high levels of both obesity and sedentary behaviour among people with schizophrenia, priority should be given to research which aims to reduce weight and increase physical activity in this group. Improving physical activity alone, however, is unlikely to reduce the prevalence of metabolic syndrome since aetiological factors are much more complex.

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