Prevalence of metabolic syndrome among Australians with severe mental illness

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ABSTRACT

Objective: To assess the prevalence of metabolic syndrome and its association with sociodemographic, clinical and lifestyle variables among Australian patients with a variety of psychiatric disorders.

Design and setting: Cross-sectional study of patients attending a public mental health service in Western Australia between July 2005 and September 2006.

Participants: Patients who were aged 18–65 years; diagnosed with schizophrenia, schizoaffective disorder, bipolar disorder, major depressive disorder with psychotic symptoms, drug-induced psychosis or borderline personality disorder; and currently taking at least one antipsychotic drug for a minimum of 2 weeks.

Main outcome measures: Prevalence of metabolic syndrome diagnosed with International Diabetes Federation criteria; fasting blood glucose and lipid levels; sociodemographic and lifestyle characteristics.

Results: Of 219 patients invited to participate, 203 agreed and had complete data. Prevalence of metabolic syndrome was 54% overall, and highest among patients with bipolar disorder or schizoaffective disorder (both 67%), followed by schizophrenia (51%). Sociodemographic variables, including age and ethnic background, were not significantly associated with metabolic syndrome, but a strong association was seen with mean body mass index. Other cardiovascular risk factors, such as smoking and substance misuse, were common among participants.

Conclusions: Prevalence of metabolic syndrome in this population was almost double that in the general Australian population, and patients with schizophrenia had a prevalence among the highest in the developed world. Prevalence was also high in patients with a variety of other psychiatric disorders.

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Metabolic syndrome is increasingly recognised as a major cause of cardiovascular disease (CVD)-related mortality and morbidity, both in the general population and in people with psychiatric illnesses such as schizophrenia.[1-4] Recent population-based research estimated that the prevalence of metabolic syndrome ranges from 29% to 34% among Australians aged over 25 years.[5,6]

The recent resurgence of interest in medical comorbidity among people with psychotic disorders,[4,7-9] together with promulgation of clinician-friendly operational definitions of metabolic syndrome,[3,10,11] has lent impetus to research on the syndrome among people with schizophrenia. Several European studies have reported a prevalence of metabolic syndrome of 28% to 37% in patients with schizophrenia,[12-15] but higher rates of 43% and 46% have been reported from the United States and Canada, respectively.[16,17] These results highlight the considerably increased risk (1.5 to 4 times) of the syndrome among people with schizophrenia compared with the general population from the same geographic region.

Systematic studies on prevalence of metabolic syndrome and other medical comorbidities in patients with schizophrenia are limited in Australia. A remarkably high prevalence of 68% for metabolic syndrome was recently reported from a public mental health service facility in New South Wales.[18] However, the sample comprised long-term patients with chronic disease, including a considerable number of long-stay inpatients.

The prevalence of metabolic syndrome among patients with psychiatric disorders other than schizophrenia has been poorly researched globally. Many lifestyle factors associated with CVD, such as unhealthy diet, sedentary lifestyle, smoking and substance misuse, are not unique to schizophrenia but are common among people with other mental illnesses.[4,19-21] In addition, speculation is increasing about the role of some atypical antipsychotic drugs in the genesis of metabolic syndrome;[1,4,8,9] these are prescribed for a range of psychiatric conditions in addition to schizophrenia.

This study aimed to assess the prevalence of metabolic syndrome and its association with sociodemographic, clinical and lifestyle variables in a sample of patients with a variety of major mental illnesses attending a public mental health service in Australia.

METHODS

Participants

This cross-sectional study was carried out at Armadale Mental Health Service, a public sector psychiatric service that serves some of the south-eastern suburbs of the Perth metropolitan area in Western Australia.

Participants were recruited from inpatients and outpatients seen by the service between July 2005 and September 2006. Criteria for inclusion were: a diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, major depressive disorder with psychotic symptoms, drug-induced psychosis or borderline personality disorder; age in the range, 18–65 years; and currently taking at least one antipsychotic drug for a minimum of 2 weeks. Psychiatric illnesses were diagnosed by the treating consultant psychiatrists based on the criteria of the International classification of diseases, 10th revision.[22] As the study was unfunded, clinical commitments precluded continuous consecutive recruitment, but no patients were included or excluded on the basis of their physical health status.

Approval for the study was obtained from the Human Research Ethics Committee, South Metropolitan Area Health Service, Fremantle, WA. Oral and written information about the study was provided to all patients, and their consent was obtained before participation.

Data collection

Sociodemographic variables, details of illness (psychiatric and medical) and a list of all current medications were collected systematically through patient interview and from available medical records.

Participant height was measured using a wall-mounted stadiometer, and weight was measured using calibrated electronic scales

with the patient wearing light clothes. Waist circumference was measured at the midpoint between the upper border of the iliac crest and the lower rib, with a tape measure horizontally circling the body. Blood pressure was measured with the patient seated, after a minimum of 10 minutes' rest. In addition, patients were asked to rate how healthy their diet was in the previous 3 months on a scale of 0–10 (with 10 being most healthy), and to estimate the number of "takeaway" meals they consumed in the previous week.

All patients had fasting blood glucose and lipid levels measured by an accredited pathology laboratory within a week of the other measurements. Blood was sampled after a minimum of 10 hours of fasting, and compliance was double-checked by clinicians when patients were reviewed with the test results.

Metabolic syndrome was diagnosed using three sets of criteria: those of the National Cholesterol Education Program's Adult Treatment Panel III (ATP III),[11] the modified ATP III criteria of the American Heart Association and National Heart, Lung and Blood Institute (AHA),[3] and the International Diabetes Federation (IDF) criteria (Box 1).[10] For the purpose of this study, any patients taking antihypertensive medication were considered to meet the blood pressure criterion, and those who were taking antidiabetic medication were considered to meet the hyperglycaemia criterion. To assess the relationship between metabolic syndrome and patient variables, the IDF definition was applied.

Statistical analysis

Continuous variables were analysed using *t* tests, and proportions using χ^2 tests. The α level was set at 0.05 for all statistical tests.

RESULTS

We invited 219 patients who met the inclusion criteria to participate in the study. Eight refused, and pathology or other data were incomplete for another eight, leaving a final sample of 203.

Participants' psychiatric diagnoses were: schizophrenia (92, 45%), bipolar disorder (39, 19%), schizoaffective disorder (18, 9%), drug-induced psychosis (24, 11%), depression with psychotic symptoms (13, 6%) and borderline personality disorder (17, 8%). The median duration of illness was 8 years (range, 1 month to 40 years). Most patients (83%) were taking atypical antipsychotic drugs, with 10% taking conventional antipsychotic drugs, and 7% taking both.

Of the 203 participants, 109 (54%) met the IDF criteria for metabolic syndrome, 100 (49%) met ATP-III criteria, and 112 (55%) met AHA criteria. There was considerable overlap between the groups who met the different sets of criteria, with 93% and 100% of those who met ATP-III criteria also meeting IDF and AHA criteria, respectively.

The prevalence of IDF-defined metabolic syndrome by psychiatric diagnosis was 67% (bipolar disorder), 67% (schizoaffective disorder), 51% (schizophrenia), 46% (major depression with psychotic symptoms), 46% (drug-induced psychosis), and 41% (borderline personality disorder). The differences in prevalence between diagnostic categories were not significant. However, when schizoaffective disorder, bipolar disorder and depression were combined into a category termed "mood disorders", the difference in prevalence between this combined group (63%) and the remaining participants (49%) approached statistical significance ($\chi^2 = 3.61$, $P = 0.06$).

The prevalence of metabolic syndrome is shown by sociodemographic, clinical and lifestyle characteristics of participants in Box 2 and Box 3. Patient characteristics are compared between those with metabolic syndrome and those without in Box 4. None of the sociodemographic variables were significantly associated with presence of the syndrome. There was no significant difference in mean age between those with and without metabolic syndrome ($t = 0.46$; $P = 0.65$) (Box 4), and the prevalence of the syndrome in those younger than 45 years was similar to the prevalence in those aged 45 or over ($\chi^2 = 1.24$, $P = 0.27$). Nor did the prevalence differ significantly between those taking atypical versus typical antipsychotic drugs (54% versus 58%).

High rates of smoking (64%) and substance misuse (48%) were observed in the sample as a whole, with patients with metabolic syndrome consuming significantly more cigarettes per day. Patients with meta-

1 Diagnostic criteria for metabolic syndrome from different sources

Criteria	ATP-III[11]*	AHA[3]*	IDF[10]†
Waist circumference (cm)			
Men	⩾ 102	⩾ 102	⩾ 94‡
Women	⩾ 88	⩾ 88	⩾ 80
Blood pressure (mmHg)	⩾ 130/85	⩾ 130/85	⩾ 130/85
High-density lipoprotein level (mmol/L)			
Men	< 1.03	< 1.03	< 1.03
Women	< 1.30	< 1.30	< 1.30
Fasting blood triglyceride level (mmol/L)	⩾ 1.7	⩾ 1.7	⩾ 1.7
Fasting blood glucose level (mmol/L)	⩾ 6.1	⩾ 5.6	⩾ 5.6

ATP III = National Cholesterol Education Program's Adult Treatment Panel III.
AHA = American Heart Association/National Heart, Lung and Blood Institute.
IDF = International Diabetes Federation.
* Three of five criteria must be present to establish the diagnosis.
† Abnormal waist circumference plus any two of the other four criteria must be present to establish the diagnosis. ‡ ⩾ 90 cm for Asian men. ◆

2 Prevalence of metabolic syndrome, by sociodemographic and clinical characteristics

Characteristic	No. with syndrome	*P**
Total group (*n* = 203)	109 (54%)	
Sociodemographic		
Sex		0.49
Men (*n* = 124)	69 (56%)	
Women (*n* = 79)	40 (51%)	
Ethnicity		0.51
European (*n* = 169)	89 (53%)	
Non-European (*n* = 34)	20 (59%)	
Marital status		0.94
Married (*n* = 47)	25 (53%)	
Not married (*n* = 156)	84 (54%)	
Employment		0.59
Employed (*n* = 40)	23 (58%)	
Unemployed (*n* = 163)	86 (53%)	
Clinical		
Hospitalisation		0.56
Yes (*n* = 82)	42 (51%)	
No (*n* = 121)	67 (55%)	
Clinical diagnosis		
Mood disorders (*n* = 70)	44 (63%)	0.06
Other (*n* = 133)	65 (49%)	

* *P* for association between sociodemographic or clinical variable and metabolic syndrome, tested by χ^2 test. ◆

3 Prevalence of metabolic syndrome, by lifestyle characteristics

Characteristic	No. with syndrome	P*
Smoking		
Yes (*n* = 130)	68 (52%)	0.60
No (*n* = 73)	41 (56%)	
Amphetamine use		
Yes (*n* = 49)	24 (49%)	0.45
No (*n* = 154)	85 (55%)	
Cannabis use		
Yes (*n* = 75)	36 (48%)	0.21
No (*n* = 128)	73 (57%)	
Opioid misuse		
Yes (*n* = 12)	2 (17%)	0.008
No (*n* = 191)	107 (56%)	
Alcohol misuse		
Yes (*n* = 49)	23 (47%)	0.28
No (*n* = 154)	86 (56%)	

* *P* for association between substance use and metabolic syndrome, tested by χ^2 test. ◆

4 Mean patient values (SD), by metabolic syndrome status

Variable	Metabolic syndrome (*n* = 109)	No metabolic syndrome (*n* = 94)	P*
Age (years)	40.0 (11.5)	39.2 (12.3)	0.65
Body mass index (kg/m^2)	32.5 (5.5)	26.1 (5.8)	< 0.001
Blood cholesterol level (mmol/L)	5.2 (1.1)	5.1 (1.0)	0.35
Years of smoking	18.2 (13)	18.0 (11)	0.91
No. of cigarettes per day	24.4 (13)	19.7 (10)	0.02
Self-rated diet score†	5.7 (2)	6.4 (2)	0.02
No. of "takeaways" in previous week	1.1 (1)	1.0 (2)	0.79

* Groups were compared using *t* tests for independent samples. † Scale of 0–10, where 10 is most healthy. ◆

5 Number of participants who met individual IDF criteria for metabolic syndrome

IDF criterion	Men (*n* = 124)	Women (*n* = 79)	χ^2	P
Waist circumference	92 (74%)	70 (89%)	6.22	0.01
Blood pressure	82 (66%)	35 (44%)	9.41	0.002
High-density lipoprotein level	72 (58%)	44 (56%)	0.11	0.74
Fasting blood triglyceride level	66 (53%)	33 (42%)	2.53	0.11
Fasting blood glucose level	51 (41%)	25 (32%)	1.85	0.17

IDF = International Diabetes Federation. ◆

bolic syndrome also self-rated their diet as less healthy than the other group.

The number of participants who met individual IDF criteria for metabolic syndrome is shown by sex in Box 5. Only 4% of men and 1% of women did not meet at least one criterion, while more than 70% of men and 50% of women met three or more, and 38% of men and 22% of women met four or more. More women than men met the criterion for abnormal waist circumference; however, more men met the criterion for hypertension.

DISCUSSION

The high prevalence of metabolic syndrome in this group of patients with psychiatric disorders (almost double the prevalence reported for the general population of Australia)[5,6] is worrying. Furthermore, the increased prevalence was not confined to patients with schizophrenia, but occurred among those with a variety of other psychiatric disorders.

Strengths of our study were the inclusion of patients at different stages of illness and the high participation rate. Limitations included the small sample size for mental disorders other than schizophrenia and, as for previous studies in this field, the cross-sectional nature of the study. In addition, the sample was not consecutively or randomly selected, and the influence of lifestyle factors such as exercise and diet were either not assessed or were not evaluated in a methodologically sound manner. Our findings may not be generalisable to psychiatric patients in other settings, such as general practice clinics and the private sector.

The prevalence of metabolic syndrome in our sample of patients with schizophrenia is slightly higher than the prevalence reported by many North American studies[16,17] and considerably higher than that reported by European studies.[12-15] These geographic differences may be partly due to differences in baseline prevalence in the general population, which could arguably be further amplified in patients with schizophrenia. The close similarity in prevalence between Australian and North American patients with schizophrenia suggests that lifestyle factors that increase vulnerability for metabolic syndrome are similar in patients in the two regions.

The 51% prevalence of metabolic syndrome that we found among patients with schizophrenia is considerably lower than the figure of 68% reported by the other published study from Australia.[18] Differences in sample characteristics, such as illness severity and proportion of the sample with chronic illness (which was higher in the other study), may have contributed to this difference. However, together these two studies highlight that the prevalence of metabolic syndrome in Australian patients with schizophrenia who use public mental health services is among the highest in the world and deserves urgent attention from service providers.

Increased mortality from natural causes is not confined to schizophrenia, but has been reported in other major psychiatric disorders, such as schizoaffective, bipolar and depressive disorders.[7,19,23] The prevalence of metabolic syndrome in our study was higher than previously reported for patients with bipolar disorder and psychotic depression.[19,20,24,25] However, our sample of patients with these diagnoses was small, and further studies with larger samples are required before any conclusions can be drawn. Genetic risk factors, increased cortisol levels, unhealthy diet, lack of exercise, propensity for the development of abdominal obesity, and antipsychotic treatment might all be common factors in the aetiology of metabolic syndrome in people with schizophrenia and affective disorders.[4,9,19] We also found an increased prevalence of metabolic disorder among patients with substance-induced psychosis and borderline personality disorder, again with a small sample size.

Replication of our results in larger samples from other settings would suggest that major psychiatric illness in general should be con-

sidered a risk factor for metabolic syndrome. This raises the question whether vigorous screening for the syndrome should be instituted for people with any form of major psychiatric disorder.[8]

Our finding that the prevalence of metabolic syndrome among adults with serious psychiatric disorders did not differ significantly between the under-45-years and 45-years-and-older age groups contrasts sharply with the clear increase in prevalence of metabolic syndrome with age reported in the general population.[2,3] Some other studies have also found that the expected increase in prevalence of metabolic syndrome with age is conspicuously absent in people with schizophrenia.[16,17,20] Together, these results suggest that people with schizophrenia (and a variety of other psychiatric disorders) are not only at increased risk of CVD, but at risk of earlier onset.

We found no difference between the sexes in prevalence of metabolic syndrome. Other studies of patients with schizophrenia have produced conflicting results.[12-18] In addition, we did not find a significantly higher prevalence of metabolic syndrome in Asian and Aboriginal patients than in white patients, but the non-white sample was relatively small. Nor did we find a particular association between current use of atypical antipsychotics and metabolic syndrome; this is consistent with results of some previous studies.[15,17,20] However, in this study we combined all atypical antipsychotics into a single group and did not analyse them separately for propensity to cause metabolic syndrome. The role of atypical antipsychotic drugs in the genesis of metabolic syndrome continues to be debated.[1,4,8,9]

There has been speculation about a genetic link between metabolic disorders and severe mental illness.[4,9,19] A systematic assessment of metabolic abnormalities in the families of people with psychiatric disorders, both with and without metabolic syndrome, would be worthwhile.

Our findings also suggest that many people with metabolic syndrome are aware their diet is unhealthy, and this might provide a window of opportunity for lifestyle and dietary interventions. The high prevalence of substance misuse and smoking in our sample corroborates previous reports.[21] The lower prevalence of metabolic syndrome observed among those misusing opioids could be due to their lower body mass index.

We found that psychiatric patients had a significantly higher prevalence of CVD risk factors other than metabolic syndrome, such as increased body mass index, smoking and substance misuse. Very few did not meet any of the criteria for metabolic syndrome, and over 70% of men and 50% of women met three or more. The combination of these factors, as well as the early age of onset of metabolic syndrome, compounds the risk of CVD in people with mental illness. Prevention, monitoring and treatment of CVD risk factors should be considered a priority by those involved in the care of people with major psychiatric disorders.

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COMPETING INTERESTS

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