Prevalence of Metabolic Syndrome in a Predominantly Cuban, Psychiatrically Ill, and Homeless Population

Rafael A. Rivas-Vazquez, PsyD; Iruma Bello, MA; Manual Sarria, LCSW; Noel D. Fernandez, MD; and Gustavo J. Rey, PhD

Objective: This study examined the prevalence of metabolic syndrome among a group of psychiatric outpatients enrolled in a homeless program that is located in a predominantly Hispanic geographic area of South Florida.

Method: Data for this retrospective, cross-sectional analysis were obtained from a record review of 122 adult patients who received full medical and psychiatric assessments based on *DSM-IV* criteria during participation in our homeless program from January 2009 to May 2009. The primary outcome measure was the presence of metabolic syndrome.

Results: The prevalence of metabolic syndrome within this population was 29.5%. Elevated waist circumference (48.5%) and elevated blood pressure (44.3%) were the 2 most frequent risk factors for the syndrome. Mean length of homelessness was 3.93 years, with no significant relationship noted between the presence of metabolic syndrome and duration of homelessness. Ninety-three percent of the subjects had been diagnosed with either schizophrenia or a mood disorder, and 61% had been treated with an atypical antipsychotic for at least 2 months over the preceding year. Our sample was predominantly Hispanic (79.5%), with Cuban Americans comprising 95% of that group. Among Hispanics, the prevalence rate of metabolic syndrome was 28.9%.

Conclusions: Within our sample, homeless individuals compared to the general adult population in the United States seem to be at equal risk for metabolic syndrome. Although other studies have suggested an increased prevalence for metabolic syndrome among Hispanics, the obtained rate for our particular Hispanic sample was consistent with estimated prevalence of non-Hispanic individuals in the United States. Intervention programs rendering services to this population should include routine screening for presence of cardiovascular risk factors constituting metabolic syndrome.

Prim Care Companion CNS Disord 2011;13(3):e1–e5

Submitted: *April 14, 2010; accepted December 21, 2010.*
Published online: *May 19, 2011(doi:10.4088/PCC.10m01002).*
Corresponding author: *Rafael A. Rivas-Vazquez, PsyD, Citrus Health Network, 4175 West 20th Ave, Hialeah, FL 33012 (rrv@citrushealth.com).*

Recent estimates regarding the prevalence of metabolic syndrome in the US adult population have ranged from 22% to 34%.[1,2] Metabolic syndrome refers to a constellation of physiological elements that serve as risk factors for cardiovascular disease.[3] Individuals afflicted with severe mental illness may be particularly at risk for metabolic syndrome, given findings that obesity and diabetes occur with increased prevalence in this group.[4,5] Studies have indicated that the prevalence rate of metabolic syndrome for patients with schizophrenia ranges from 37% to 40.9%.[6,7] Within a sample of individuals diagnosed with bipolar disorder, the prevalence of metabolic syndrome was found to be 30%.[8]

As a group, the homeless struggle with a higher prevalence of mental illness, physical morbidity, and increased mortality. In a study[9] comparing mortality rates among the homeless in 7 cities throughout North America and Europe, data indicated that homeless individuals are 3 to 4 times more likely to die at an earlier age than members of the general population. In the study,[9] the average life expectancy for a person without permanent housing was placed between 42 and 52 years, far below the country's average expectancy of 80 years. Cardiovascular disease is a significant cause of morbidity and mortality within this population; it has been noted that homeless men are 40%–50% more likely to die secondary to cardiovascular disease than men in the general population.[10] Although studies have identified the frequency with which distinct metabolic syndrome risk factors occur within the homeless population,[11,12] prevalence rates for homeless individuals meeting criteria for the full syndrome are not frequently reported.

The purpose of this study was to determine the prevalence of metabolic syndrome in a group of individuals who had been diagnosed with a mental illness and who were receiving services from one of our homeless programs at Citrus Health Network, a federally qualified health center located within a predominantly Hispanic area of Miami-Dade County, Florida. Given the region's population demographics, we were interested in observing the rate of metabolic syndrome among the Hispanics in our particular sample. To date, studies seem to suggest that Hispanics may demonstrate slightly higher metabolic syndrome rates than non-Hispanics in the general population.[1,2]

Clinical Points

- Homeless individuals with psychiatric illness demonstrate rates of metabolic syndrome that seem to be comparable with the general adult population in the United States.
- Clinicians delivering care to this population should be very active in performing assessments to determine the presence of risk factors for metabolic syndrome.

Hispanics in these studies were Mexican American, a group that is typically underrepresented within our geographic area. Consequently, the current study allowed us to report on prevalence rates for a Hispanic group that has not yet been reported, Cuban Americans.

METHOD

The present study was approved by our institutional review board (IRB). The study involved a retrospective analysis of data sets obtained from our homeless program. In keeping with guidelines from our IRB, no identifying information was utilized in data analysis or subsequent reporting.

Upon admission to the homeless program, all participants undergo psychiatric and medical assessment. Psychiatric evaluation was conducted in order to obtain a *DSM-IV* multiaxial diagnosis. Each participant's substance use history was reviewed in order to determine whether *DSM-IV* criteria for substance abuse or dependence were met. Each participant was also seen in our primary care clinic to collect medical history and undergo physical examination. In addition to standard vital signs, measurement of waist circumference was conducted, midway between the lowest rib and the iliac crest while standing. Routine laboratory assessment was ordered for each participant, including comprehensive metabolic panel and lipid profile.

We reviewed the records of 122 homeless individuals who were consecutively referred to our homeless program from January 2009 to May 2009. In addition to demographic information, we recorded *DSM-IV* multiaxial diagnoses for each participant, as well as number of years being homeless. Given the observation that a class of medications typically used to treat these individuals—the atypical antipsychotics—appears to increase the risk of metabolic disturbances,[13] we captured any exposure to atypical antipsychotic medication for a period longer than 2 months over the year prior to admission. Height and weight were recorded and used to derive body mass index (BMI [kg/m^2]) for each participant. Blood pressure and waist circumference were also recorded. Laboratory data included cholesterol, fasting glucose, and triglycerides.

To establish the presence of metabolic syndrome, we selected the criteria developed by the National Cholesterol Education Program for clinical identification of the syndrome.[3] We determined that an individual had metabolic syndrome if 3 or more of the following components were identified: waist circumference > 102 cm for men and ≥ 88 cm for women, a fasting blood triglyceride level ≥ 150 mg/dL, high-density lipoprotein cholesterol level < 40 mg/dL for men and < 50 mg/dL for women, blood pressure ≥ 130/85 mm Hg, and a fasting glucose level ≥ 100 mg/dL.

Descriptive statistics were computed for basic demographic and clinical variables, as well as for variables serving as risk factors for metabolic syndrome. Chi square analyses were performed to examine the associations among categorical variables, such as diagnoses, medications, and presence of metabolic syndrome. A 1-way analysis of variance (ANOVA) was conducted to determine differences between presence of metabolic syndrome and continuous variables, such as age, years of homelessness, and BMI. Correlations were also performed to assess the associations between risk factors for metabolic syndrome (eg, fasting glucose, waist circumference) and BMI. All tests performed were 2-sided, with a significance level of $\alpha = .05$.

RESULTS

Clinical and demographic data are summarized in Table 1. The mean age of the participants was 50.1 years (SD = 9.37). One hundred participants (82%) were male. The mean length of homelessness was 3.93 years (SD = 3.89). As expected based on area demographics, ethnicity for the majority of participants was Hispanic (n = 97, 79.5%), with 95% (n = 92) of that group being Cuban. Of the 25 participants that were not Hispanic, 10 participants (40%) were Anglo and 10 (40%) were African Americans. Educationally, 79 participants (64.8%) had attended high school or had advanced beyond. Most of the participants had received a *DSM-IV* diagnosis of either schizophrenia (n = 46, 37.7%) or mood disorder (n = 67, 54.9%); within the mood disorder category, 48 (39.3%) were diagnosed with major depressive disorder and 19 (15.6%) were diagnosed with bipolar disorder. Fifty-three participants (43.4%) had received a diagnosis of substance abuse or dependence. With regard to medications, 74 participants (60.7%) had been treated with an atypical antipsychotic for at least 2 months over the preceding year.

Table 1. Demographics and Clinical Information (N = 122)

Variable	n	%
Age, y	50.09[a]	9.37[b]
Years homeless	3.93[a]	3.89[b]
Gender		
Male	100	82
Female	22	18
Ethnicity		
African American	10	8.2
Anglo	10	8.2
Hispanic—Cuban American	92	75.4
Hispanic—Other	5	4.1
Other	5	4.1
Education		
< 8th grade	43	35.2
Some high school	40	32.8
High school graduate	26	21.3
Some college	13	10.6
Diagnosis		
Schizophrenia spectrum disorder	46	37.7
Bipolar disorders	19	15.6
Depression disorders	48	39.3
Anxiety disorders	2	1.6
Other	7	5.7
Substance abuse disorders		
Yes	53	43.4
No	69	56.6
Atypical antipsychotic[c]		
Yes	74	60.7
No	48	39.3

[a]Value reported is mean.
[b]Value reported is SD.
[c]Coded yes if taking an atypical antipsychotic for ≥ 2 months over the preceding year.

Table 2. Metabolic Syndrome and Body Mass Index in Sample

	Total Sample (N = 122)		Men (n = 100)		Women (n = 22)	
Variable	n	%	n	%	n	%
Metabolic syndrome	36	29.5	29	29	7	31.8
Waist (men, > 102 cm; women, ≥ 88 cm)	59	48.5	39	39	20	90.9
Blood pressure (≥ 130/85 mm Hg)	54	44.3	46	46	8	36.4
HDL cholesterol (men, < 40 mg/dL; women, < 50 mg/dL)	14	11.5	10	10	4	18.2
Triglyceride (≥ 150 mg/dL)	47	38.5	43	43	4	18.2
Glucose (≥ 100 mg/dL)	25	20.5	20	20	5	22.7
Body mass index (kg/m^2)						
Normal (≤ 24.9)	30	24.6	29	29	1	4.5
Overweight (25.0–29.9)	44	36.1	37	37	7	31.8
Obese (≥ 30.0)	48	39.3	34	34	14	63.6

Abbreviation: HDL = high-density lipoprotein.

The mean BMI for the sample was 29.03 (SD = 5.85). Forty-four participants (36.1%) were classified as overweight (BMI = 25.0–29.9) and 48 (39.3%) were classified as obese (BMI ≥ 30) (Table 2). The percentage of women meeting criteria for obesity (63.6%) was significantly greater than for men ($\chi^2_2 = 8.55$, $P = .01$). A 1-way ANOVA was used to test for differences in age among BMI classifications of normal, overweight, and obese subjects. Age differed significantly across

Table 3. Metabolic Syndrome and Number of Criteria Prevalence in Sample

	Total Sample (N = 122)		Men (n = 100)		Women (n = 22)	
Variable	n	%	n	%	n	%
Metabolic syndrome	36	29.5	29	29	7	31.8
No criteria	29	23.8	27	27	2	9.1
1 criterion	35	28.7	25	25	10	45.5
2 criteria	22	18.0	19	19	3	13.6
3 criteria	27	22.1	21	21	6	27.3
4 criteria	9	7.4	8	8	1	4.5
5 criteria	0	0	0	0	0	0

the 3 categories, ($F_{2,119} = 6.62$, $P = .002$). Tukey post hoc comparisons of the 3 groups indicated that the obese group (mean = 46.48 years; 95% CI, 43.60–49.36) was significantly younger than both the overweight group (mean = 51.89 years; 95% CI, 49.32–54.46; $P = .013$) and the normal group (mean = 53.23 years; 95% CI, 50.23–56.23; $P = .004$). Age comparisons between the normal and overweight groups were not statistically significant. No significant differences were found among BMI and gender, years of homelessness, ethnicity, *DSM-IV* diagnosis, and treatment with atypical antipsychotic medications.

The prevalence rate of metabolic syndrome in this sample was 29.5%. Although not statistically significant, the percentage of individuals with a diagnosis of schizophrenia (37%) demonstrated a trend toward increased prevalence of metabolic syndrome. With regard to ethnicity, the prevalence rate of metabolic syndrome for our Hispanic group was 28.9%. There was no significant difference between Hispanics versus non-Hispanics. In examining differences of metabolic syndrome across our ethnic groups, we found that Cuban Americans demonstrated a significantly higher prevalence rate of 29.3% ($\chi^2_5 = 15.87$, $P = .007$). This is not surprising, as Cuban Americans constituted 75% of the total sample.

Prevalence for each risk factor and the number of criteria demonstrated by participants in our sample are shown in Tables 2 and 3. The most frequent risk factor for metabolic syndrome found was elevated waist circumference (48.5%), with significantly more men (66.1%) than women meeting the criteria for this variable ($\chi^2_1 = 19.46$, $P = .000$). The second highest risk factor within the sample was increased blood pressure (44.3%). Elevated triglyceride level, the third most common risk factor (38.5%), yielded several group differences. Specifically, there were significantly more men (91.5%) within this group than women ($\chi^2_1 = 4.69$, $P = .030$). Additionally, a diagnosis of schizophrenia (55.3%) was significantly more common in this group ($\chi^2_5 = 11.84$, $P = .037$), and significantly more participants (59.6%) were treated with atypical antipsychotics ($\chi^2_2 = 6.66$, $P = .036$). There were no other significant differences among demographic or clinical variables and risk factors

for metabolic syndrome. Results indicated that 28.7% of participants had at least 1 risk factor for the syndrome, while 18% had 2 risk factors. Within our sample, 23.8% had no risk factors for the metabolic syndrome.

A 1-way ANOVA demonstrated a significant association between BMI and presence of metabolic syndrome ($F_{1,120} = 14.87$, $P = .000$). As expected, participants meeting criteria for metabolic syndrome had higher BMI (mean = 32.01; 95% CI, 30.15–33.88) than those participants not meeting criteria (mean = 27.78; 95% CI, 26.59–28.97). Pearson product-moment correlation coefficients were computed to determine associations between BMI and risk factors for metabolic syndrome. As expected, there was a significant positive correlation between waist circumference and BMI ($r = 0.85$, $P = .01$). Body mass index also demonstrated a significant positive correlation with diastolic blood pressure ($r = 0.22$, $P = .05$) and systolic blood pressure ($r = 1.00$, $P = .01$). Levels of high-density lipoprotein cholesterol demonstrated a significant negative correlation with BMI ($r = -0.22$, $P = .05$). Triglyceride and glucose levels were not significantly correlated with BMI.

DISCUSSION

To our knowledge, this is the first study that examines the prevalence of metabolic syndrome within a mentally ill homeless population, particularly one with a primarily Hispanic composition. Furthermore, while other studies have isolated Mexican Americans as their Hispanic group, our population was predominantly composed of Cuban Americans (95%). The observed rate for metabolic syndrome for our entire sample was 29.5%, which is generally consistent with rates reported in studies that have sought to determine metabolic syndrome prevalence within the United States.[1,2] With regard to Hispanic rates, while other studies have seemed to suggest an elevated risk among Hispanics, our obtained rate of 28.9% for our particular Hispanic sample does not support this contention.

Waist circumference was the most frequent risk factor (48.5%) found in our sample, with men being overly represented in this group. Other studies based on homeless individuals have found that elevated blood pressure—which emerged as our second-highest risk factor at 44.3%—was the most prevalent metabolic syndrome component,[11,12] contributing to the overall morbidity and mortality demonstrated by the homeless. With regard to BMI, although it is currently not a specific criterion element for metabolic syndrome, we nonetheless observed a significant association within our sample of increased BMI and the presence of metabolic syndrome.

A significant difference was noted within the group of participants manifesting hypertriglyceridemia, which was our third most frequent risk factor (38.5%). Most within this group carried a diagnosis of schizophrenia and were being treated with atypical antipsychotics. Although the size of our sample precluded analysis to parse out any further relationship between this risk factor and other clinical variables (eg, medications), elevated serum triglycerides is an element of interest, as it relates to metabolic syndrome within a psychiatric population. It has been noted that, given its association with insulin resistance, hypertriglyceridemia may represent a valuable clinical marker for metabolic syndrome.[14] Given that those with schizophrenia may be at particular risk for metabolic syndrome, coupled with the adverse impact of the antipsychotic treatment on serum lipids, recommendations have been made for obtaining a lipid panel at baseline and at appropriate intervals during treatment.[15] Furthermore, it has been suggested that ethnicity may play a moderating effect in determining those who may be at increased risk for developing lipid abnormalities and other metabolic disturbances during antipsychotic treatment.[16]

The current study has some limitations. Although the prevalence rate of metabolic syndrome for our sample was readily derived from the study's cross-sectional design, a prospective and longitudinal study would have allowed for greater control over specific variables (ie, the role of antipsychotic medications), as well as provide data as to the natural course of metabolic syndrome in this particular population over time. The absence of a control group also limited conclusions that could have been made regarding generalizability of our findings. Additionally, although the sample size seems comparable to other studies examining psychiatrically ill populations, it is small compared to large-scale studies examining prevalence rates of metabolic syndrome within US adults or homeless populations. Within our sample, there was also a disproportionately larger number of men, which could have affected results by masking gender differences.

We feel that our study underscores the need to be concerned regarding the cardiovascular health of homeless individuals. Programs designed to render services to this population should, at the very least, include routine screening for elements comprising metabolic syndrome. Our study also adds to the growing literature as to potential health disparities among ethnic minorities. Additional research geared at determining rates of cardiovascular risk factors among other Hispanic groups is encouraged to provide data regarding genetic and lifestyle factors that may impact the development of metabolic syndrome.

Author affiliations: Citrus Health Network, Hialeah (Drs Rivas-Vazquez and Fernandez, Ms Bello, and Mr Sarria), and The Brain Institute, Miami Children's Hospital (Dr Rey), Florida.
Potential conflicts of interest: None reported.
Funding/support: None reported.

REFERENCES

1. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. *JAMA*. 2002;287(3):356–359.
2. Ervin RB. *Prevalence of Metabolic Syndrome Among Adults 20 Years of Age And Over, By Sex, Age, Race and Ethnicity, and Body Mass Index: United States, 2003–2006. National Health Statistics Reports; No. 13*. Hyattsville, MD: National Center for Health Statistics; 2009.
3. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation*. 2002;106(25): 3143–3421.
4. Saha S, Chant D, McGrath J. A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? *Arch Gen Psychiatry*. 2007;64(10):1123–1131.
5. Roshanaei-Moghaddam B, Katon W. Premature mortality from general medical illnesses among persons with bipolar disorder: a review. *Psychiatr Serv*. 2009;60(2):147–156.
6. Heiskanen T, Niskanen L, Lyytikäinen R, et al. Metabolic syndrome in patients with schizophrenia. *J Clin Psychiatry*. 2003;64(5):575–579.
7. McEvoy JP, Meyer JM, Goff DC, et al. Prevalence of the metabolic syndrome in patients with schizophrenia: baseline results from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) schizophrenia trial and comparison with national estimates from NHANES III. *Schizophr Res*. 2005;80(1):19–32.
8. Fagiolini A, Frank E, Scott JA, et al. Metabolic syndrome in bipolar disorder: findings from the Bipolar Disorder Center for Pennsylvanians. *Bipolar Disord*. 2005;7(5):424–430.
9. O'Connell JJ. Premature mortality in homeless populations: a review of the literature. Nashville, TN: National Health Care for the Homeless Council; 2005. http://www.nhchc.org/PrematureMortalityFinal.pdf. Accessed February 25, 2011.
10. Hwang SW. Mortality among men using homeless shelters in Toronto, Ontario. *JAMA*. 2000;283(16):2152–2157.
11. Szerlip MI, Szerlip HM. Identification of cardiovascular risk factors in homeless adults. *Am J Med Sci*. 2002;324(5):243–246.
12. Lee TC, Hanlon JG, Ben-David J, et al. Risk factors for cardiovascular disease in homeless adults. *Circulation*. 2005;111(20):2629–2635.
13. American Diabetes Association, American Psychiatric Association, American Association of Clinical Endocrinologists, et al. Consensus development conference on antipsychotic drugs and obesity and diabetes. *Diabetes Care*. 2004;27(2):596–601.
14. Grundy SM. Hypertriglyceridemia, insulin resistance, and the metabolic syndrome. *Am J Cardiol*. 1999;83(9B):25F–29F.
15. Meyer JM, Koro CE. The effects of antipsychotic therapy on serum lipids: a comprehensive review. *Schizophr Res*. 2004;70(1):1–17.
16. Meyer JM, Rosenblatt LC, Kim E, et al. The moderating impact of ethnicity on metabolic outcomes during treatment with olanzapine and aripiprazole in patients with schizophrenia. *J Clin Psychiatry*. 2009;70(3):318–325.