Association of Psychiatric Illness and Obesity, Physical Inactivity and Smoking among a National Sample of Veterans

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Abstract

Background—Increased cardiovascular morbidity and mortality has been reported across a number of chronic psychiatric illnesses. Interventions to decrease cardiovascular risk have focused on single health behaviors.

Objective—To evaluate the co-occurrence of multiple poor health behaviors which increase cardiovascular risk among veterans with psychiatric diagnoses.

Methods—Using data from the 1999 Large Health Survey of Veterans (n=501,161), multivariate logistic regression was used to evaluate the associations between current smoking, no regular exercise, and obesity with each of six Axis I diagnoses.

Results—There were statistically increased odds of co-occurrence of obesity, current tobacco use and no regular exercise among veterans with each of the psychiatric diagnoses, with the exception of drug use disorders (which was not significantly different from 1). The highest odds were among veterans with schizophrenia, PTSD, and bipolar disorder [OR (95% CI) of 1.37 (1.29, 1.45); 1.26 (1.20, 1.32); and 1.19 (1.11, 1.25), respectively]. The OR for depression was not significant after adjustment for medical co-morbidity.

Conclusions—Veterans with psychiatric illnesses, and particularly those with schizophrenia, PTSD, and bipolar disorder, are much more likely to have multiple poor health behaviors that increase their cardiovascular risk. Interventions to decrease cardiovascular risk among veterans with serious mental illness need to target multiple health behaviors.

Background

Increased morbidity and mortality from cardiovascular disease has been reported across a spectrum of chronic psychiatric illnesses, including schizophrenia (1–2), major depressive

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disorder (3), bipolar disorder (4) and posttraumatic stress disorder (5). Despite the strong evidence of a link between psychiatric illness and poor cardiovascular outcomes, the explanation for this association is incompletely understood. Several mechanisms have been proposed to explain this association, including biological mediators: lower heart rate variability (6), higher catecholamine levels (7), enhanced activity of the hypothalamic pituitary axis (8), and lower levels of omega-3 fatty acids (9). In addition, second generation antipsychotic medications (10–11) have recognized adverse metabolic effects, including increased risk of metabolic syndrome, the presence of which is associated with a 3-fold increase risk of cardiovascular disease and a 6-fold increase in risk of cardiovascular mortality (12), and diabetes. Receipt of lower quality of medical care may also be a contributing factor, as studies have suggested that patients with psychiatric illness receive less intensive control of cardiovascular risk factors (13) and poorer quality of post-myocardial infarction medical care (14). There is also recent evidence to suggest that poor adherence to lipid-lowering medication may be a major risk factor for cardiovascular mortality in the general population (15); and patients with serious mental illness appear to have particular difficulties adhering to antihypertensive or lipid-lowering medications (16).

Poor health behaviors, such as smoking, lack of exercise and poor diet, also contribute to the excess cardiovascular morbidity and mortality experienced by patients with psychiatric illness (17–19). Increasing attention has been paid to the prevalence of these behaviors, as they are potentially modifiable risk factors that may be targets for interventions to improve medical outcomes.

While increased rates of tobacco dependence have long been recognized across psychiatric disorders (20), only a few small studies have examined diet and exercise health behaviors among outpatients with schizophrenia or other psychiatric illnesses (17–18,21). These studies have been limited by small sample sizes which may not be representative of persons living with serious mental illness. Moreover, these studies have typically focused on single health behaviors. While interventions have been developed to improve single health behaviors among persons with psychiatric illness (22–24), patients in clinical care typically present with multiple behaviors that increase cardiovascular risk. This should be of particular concern to clinicians, as the total risk associated with multiple cardiovascular risk factors is significantly higher than the sum of the individual risk factors (25).

The specific aim of the current study is to describe the association between psychiatric diagnoses and health behaviors which increase cardiovascular risk in a large national sample of veterans in primary care. We hypothesized that patients with psychiatric illnesses would have an increased prevalence of more than two negative health behaviors when compared to a control population of veterans receiving primary care.

Methods

Sample

Analyses were conducted using data from the 1999 Large Health Survey of Veteran Enrollees (LHS), the largest health survey of veterans ever conducted (26). The LHS was a structured questionnaire that documented sociodemographic characteristics, health status, health behaviors and health care needs. Participants were sampled from the March 1999 – September 1999 VA enrollment files. A total of 1,406,049 enrollees were sent surveys and 887,775 returned the questionnaire, for a response rate of 63.1% (26). A total of 501,161 respondents had complete data on survey variables used in this study.

Definitions and Measures

Psychiatric diagnoses—Veterans with psychiatric illness were identified from diagnostic information available in VA administrative records. Diagnoses were defined by having at least one inpatient visit or two outpatient visits with an ICD-9-CM code (27) for any of six psychiatric diagnoses (as a primary or secondary diagnosis): schizophrenia or schizoaffective disorder (295.xx), bipolar disorder (296.0x, 296.1x, 296.40–296.89), major depressive disorder (296.2–296.39), Posttraumatic Stress Disorder or PTSD (309.81), alcohol abuse or dependence (303.xx or 305.00), or drug abuse or dependence (292.01-292.99 or 304.xx or 305.20-305.99). Diagnoses were defined at the time of the survey; administrative data were linked to the survey by social security number.

Health behaviors—The LHS survey included questions about tobacco use and exercise frequency. Current tobacco use was defined as smoking at least 100 cigarettes in a subject's lifetime <u>and</u> currently smoking cigarettes every day or some days based on responses to two questions: 1) "Have you smoked at least 100 cigarettes in your life?"; and 2) "Do you now smoke cigarettes every day, some days or not at all?".

The exercise frequency question in the LHS asked respondents how often do you engage in regular activities (e.g., brisk walking, jogging, bicycling, etc) long enough to work up a sweat? Categorical responses ranged from never to more than five times per week. For the logistic regression analyses, responses were dichotomized into any regular exercise compared to none.

Obesity—Body mass index (BMI, kg /m^2) was calculated from self-reported height and weight data collected in the LHS survey. Using the BMI categories adopted by the NHLBI and WHO (28–29), BMI levels were categorized as normal weight (BMI <=24.9); overweight (BMI 25.0–29.9); and obese (BMI >=30.0).

Medical Co-morbidity—Medical co-morbidity was evaluated based on previously validated patient self-report of medical diagnoses in the LHS survey (30). Veterans were specifically asked about the presence of twelve common chronic medical conditions in the survey, and the count of these diagnoses was used in the analyses.

Demographic characteristics—Analyses included demographic characteristics of participants, including age, gender, race, education, service connected disability, and rurality of residence.

Statistical methods

First, bivariate correlations between each of the six psychiatric diagnoses and current smoking, exercise frequency and obesity were evaluated. The prevalence of each of these, and then of all three characteristics, among veterans with each of the six psychiatric diagnoses was compared to that among veterans without that diagnosis, using chi-square analyses. Multivariate logistic regression was then used to evaluate the odds of current smoking, no regular exercise, and obesity among veterans with each of the six psychiatric diagnoses, after adjusting for sociodemographic characteristics (age, gender, race, education, residence, and service connected disability), and medical co-morbidity. All data analyses were conducted using the SAS software version 9.1 (SAS Institute Inc., Cary NC).

Results

The demographics and clinical characteristics of the sample are shown in Table 1. The mean age of study subjects was 64.1 years, and the sample was 95.9% male and 85.8% Caucasian.

Rates of the six psychiatric diagnoses ranged from 1.9% for bipolar disorder and substance use disorders to 6.2% for PTSD. These rates are representative of those of the general VA population, as we have previously reported (31). 26.2% of the sample reported that they were current smokers, which is higher than the prevalence of current smoking in the US general population (19.8%) (32). 31.5% of the LHS sample were obese, which is consistent with reported age-adjusted rates in the general US population (32.2%) (33). 26.8% of participants reported aerobic exercise at least 3 times per week, which meets the physical activity guidelines of the American College of Sports Medicine and the American Heart Association (34). 39.9% of participants reported no exercise.

In the bivariate analyses, each of the six psychiatric diagnoses was statistically significantly associated with increased rates of current tobacco use and no weekly exercise, when compared to veterans without that psychiatric diagnosis (Table 2). Rates of obesity were also higher among veterans with all of the psychiatric diagnoses except alcohol abuse or dependence (which had significantly lower rates of obesity). The rate of co-occurring obesity, current smoking and no weekly exercise was more than two and a half times higher among veterans with psychiatric diagnoses when compared to veterans with no psychiatric diagnosis—and was highest among veterans with schizophrenia (10.0% of this group) (Table 2).

In the multivariate logistic regression analyses, current smoking was significantly associated with male gender, black race, and all of the psychiatric diagnoses except major depressive disorder. OR (95% CI) for current smoking across the psychiatric diagnoses ranged from 1.74 (1.66, 1.83) for drug abuse and dependence to 3.08 (2.98, 3.19) for alcohol abuse and dependence. Age greater than 50, higher educational level and Hispanic race were all significantly associated with statistically decreased odds of current smoking (table 3).

Veterans with major depressive disorder and PTSD had statistically significantly increased odds of no regular exercise [OR (95% CI) of 1.14 (1.10, 1.17) and 1.09 (1.06, 1.12), respectively]. With adjustment for medical comorbidity, veterans with schizophrenia were significantly less likely to have no regular exercise (Table 3).

Obesity (BMI > 30 kg/m2) was significantly associated with female gender; veterans with higher levels of education had lower odds of obesity. Alcohol and drug abuse and dependence were associated with significantly decreased odds of obesity, but all other psychiatric diagnoses were associated with significantly increased odds, ranging from 1.05 (1.01, 1.09) for schizophrenia to 1.25 (1.19, 1.30) for bipolar disorder (Table 3).

The final logistic regression model revealed statistically increased odds of the co-occurrence of obesity, current tobacco use and no regular exercise among veterans with each of the psychiatric diagnoses, with the exception of drug use disorders (which was not significantly different from 1). The highest odds were among veterans with schizophrenia, PTSD, and bipolar disorder [OR (95% CI) of 1.37 (1.29, 1.45); 1.26 (1.20, 1.32); and 1.19 (1.11, 1.28), respectively].

Discussion

In this large national sample of veterans, self-reported health behaviors (current smoking and regular exercise) differed between patients with and without psychiatric illness. Patients with each of four Axis I diagnoses or alcohol abuse or dependence had significantly higher rates of multiple poor health behaviors (current smoking, no regular exercise, and obesity) when compared to veterans without these diagnoses. Findings of the bivariate analyses are consistent with previous literature demonstrating an increased prevalence of each of these behaviors among persons with serious mental illness (17–18,21). This study, however,

demonstrates high rates of the co-occurrence of all three behaviors, with 10% of veterans with schizophrenia or bipolar disorder reporting all three cardiovascular risk factors. Even after adjustment for age, race, gender, educational level, and medical comorbidity, veterans with schizophrenia, PTSD, bipolar disorder, or major depression had significantly increased odds of having all cardiovascular three risk factors. Veterans with schizophrenia were 37% more likely to be current smokers, obese and not exercise.

These results have implications for cardiovascular risk that is separate from the biologic effects of the disorders, or the adverse metabolic effects associated with pharmacotherapy used to treat psychotic or affective disorders. Our findings are consistent with those of the Heart and Soul Study which suggested that the increased risk of cardiovascular events associated with depression could potentially be preventable with behavior modification, especially increased exercise. In this prospective cohort of 1017 outpatients with coronary heart disease, measured biological markers accounted for only a small part of the association between depression and increased risk of cardiovascular events. After adjustment for physical activity and other health behaviors, however, no significant association between depressive symptoms and cardiovascular events remained (35).

Our study had several limitations. First, psychiatric diagnoses were based on administrative data, and previous literature has demonstrated that this may result n significant under-diagnosis of psychiatric illness (36–37). Moreover, this effect is likely to differ across the psychiatric diagnoses that were evaluated in this study: i.e., it is more likely that a diagnosis of depression would be missed (compared to schizophrenia), given the more episodic nature of depression. Any potential bias in our results from this under-reporting would likely falsely attenuate the differences between the groups, as patients with disorders would have mistakenly been categorized as having no psychiatric illness. Second, data on weight and health behaviors were based on self-report, and this is likely to result in under-estimation of weight and over-estimation of positive health behaviors (38). If veterans without psychiatric illness over-estimated their good health behaviors to a greater extent than veterans with serious mental illness, this might explain some of the differences observed in the study. There is, however, no clear evidence that persons with serious mental illness more reliably report engaging in poor health behaviors. Third, LHS survey data was collected in 1999 and there have been reports that rates of obesity have increased since 1999 (33), and rates of smoking have decreased (32). Our results may therefore under-estimate the current association between poor health behaviors and schizophrenia or bipolar disorder. Fourth, our analyses specifically aimed to evaluate the independent effect of each of six diagnoses on several health behaviors. Psychiatric epidemiology literature suggests high rates of co-morbid psychiatric condition among individuals with psychiatric illness (39). Evaluation of the impact of psychiatric co-morbidity was beyond the scope of the current study, but there is a need for future research to address this. Similarly, future studies might also evaluate the impact of specific psychiatric medications on these health behaviors, as these analyses were also beyond the scope of the current paper. Finally, our findings may have limited generalizability outside of the VA system. As a group, veterans receiving care through the VA system are typically older, have more medical illnesses, and have more negative health behaviors (40).

In conclusion, persons with psychiatric illnesses, and particularly those with schizophrenia, PTSD, and bipolar disorder, are much more likely to have multiple poor health behaviors that increase their cardiovascular risk, adding an additional layer of clinical complexity to a population already at significantly increased risk of cardiovascular morbidity and mortality. Innovative programs such as the integration of smoking cessation treatment into mental health treatment (41) show promise as a means of improving access to effective interventions to improve health behaviors. Interventions to decrease cardiovascular risk

among persons with serious mental illnesses may need to target multiple health behaviors in order to improve cardiovascular outcomes in this vulnerable population.

Acknowledgments

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Table 1

Demographics and Clinical Characteristics of the 1999 Large Health Survey of Veterans (LHS) (n=501,161)

Characteristic	Percentage or Mean (standard deviation)
Age	64.1 (12.9)
Race	
African American	9.4%
Hispanic	4.8%
Gender, % male	95.9%
Schizophrenia diagnosis	3.1%
Bipolar disorder diagnosis	1.9%
Major depressive disorder diagnosis	7.1%
PTSD diagnosis	6.2%
Alcohol abuse or dependence diagnosis	4.0%
Drug abuse or dependence diagnosis	1.9%
Medical co-morbidity index (number of diagnoses)	4.4 (2.9)
BMI (kg/ m^2), mean (SD) (n=548,480)	28. 5 (5.0)
% underweight (BMI < 18.5)	1.0%
% normal weight (BMI 18.5–25.0)	23.2%
% overweight (BMI 25.0–30.0)	44.3%
% obese (BMI >30)	31.5%
% of subjects who have smoked more than 100 cigarettes in lifetime	78.1%
Current smoking	
Every day	20.4%
Some days	5.8%
Not at all	73.8%
Frequency of exercise (intense and long enough to work up a sweat)	
None	39.9%
Less than once per week	16.7%
1–2 times per week	16.6%
3–4 times per week	14.9%
5 or more times per week	11.9%

Table 2

Bivariate correlations (χ^2) between Axis I diagnosis and poor health behaviors among respondents to 1999 Large Health Survey of Veterans (n= 501,161)

	Current smoker	P value	No weekly exercise	P value	Obesity (BMI >30 kg/m2)	P value	Current smoker, no weekly exercise and obese	P value
Total	26.2%		56.5%		30.5%		4.3%	
Schizophrenia	49.3%	<0.0001	62.2%	<0.0001	36.3%	<0.0001	10.0%	<0.0001
Alcohol abuse or dependence	65.6%	<0.0001	61.3%	<0.0001	24.1%	<0.0001	8.5%	<0.0001
Drug abuse or dependence	68.6%	<0.0001	60.2%	<0.0001	25.9%	<0.0001	9.9%	<0.0001
Bipolar	45.4%	<0.0001	62.2%	<0.0001	39.2%	<0.0001	9.9%	<0.0001
Major depressive disorder	36.7%	<0.0001	67.0%	<0.0001	37.1%	<0.0001	8.0%	<0.0001
PTSD	39.7%	<0.0001	67.5%	<0.0001	36.9%	<0.0001	8.9%	<0.0001

Table 3

Table 2. Multivariate logistic regression analyses of poor health behaviors by respondents to 1999 Large Health Survey of Veterans (n=501,161)

	Current smoker	No regular exercise	Obese	Smokes, obese, does not exercise
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age 40–49[a]	1.44 (1.32, 1.42)	1.15 (1.08, 1.19)	1.17 (1.13, 1.22)	1.34 (1.25, 1.44)
Age 50–64 [a]	0.86 (0.83, 0.89)	1.18 (1.13, 1.21)	1.13 (1.09, 1.17)	0.95 (0.89, 1.02)
Age 65–74 [a]	0.31 (0.30, 0.33)	1.04 (1.02, 1.06)	0.77 (0.75, 0.80)	0.29 (0.27, 0.31)
Age 75–84 [a]	0.14 (0.14, 0.15)	1.10 (1.06, 1.14)	0.43 (0.41, 0.44)	0.09 (0.09, 0.10)
Age >=85 [a]	0.07 (0.06, 0.07)	1.74 (1.59, 1.82)	0.19 (0.17, 0.20)	0.03 (0.02, 0.05)
Gender, male [b]	1.14 (1.10, 1.18)	0.85 (0.81, 0.87)	0.88 (0.85, 0.91)	0.92 (0.86, 0.98)
Education category[c]	0.82 (0.81, 0.82)	0.81 (0.81, 0.82)	0.97 (0.96, 0.98)	0.83 (0.82, 0.84)
Black race [d]	1.21 (1.18, 1.23)	1.01 (0.99, 1.04)	0.96 (0.95, 0.98)	0.86 (0.82, 0.89)
Hispanic race [d]	0.76 (0.74, 0.79)	0.82 (0.80, 0.85)	1.01 (0.98, 1.04)	0.77 (0.72, 0.83)
Other race [d]	1.14 (1.10, 1.17)	0.92 (0.90, 0.95)	0.99 (0.97, 1.02)	1.05 (0.99, 1.11)
Service connection <50[f]	0.75 (0.73, 0.76)	1.02 (1.01, 1.04)	1.05 (1.03, 1.06)	0.87 (0.84, 0.91)
Service connection >50[f]	0.80 (0.79, 0.82)	1.62 (1.59, 1.64)	1.00 (0.98, 1.02)	0.99 (0.95, 1.02)
Medical co- morbidity	1.03 (1.02, 1.03)	1.11 (1.11, 1.11)	1.06 (1.06, 1.06)	1.09 (1.08, 1.09)
Alcohol abuse or dependence[e]	3.08 (2.98, 3.19)	1.02 (0.98, 1.05)	0.53 (0.51, 0.55)	1.05 (0.99, 1.11)
Drug abuse or dependence[e]	1.74 (1.66, 1.83)	0.93 (0.89, 1.01)	0.73 (0.70, 0.77)	1.04 (0.96, 1.13)
Schizophrenia[e]	1.69 (1.63, 1.75)	0.92 (0.89, 0.95)	1.05 (1.01, 1.09)	1.37 (1.29, 1.45)
Bipolar[e]	1.18 (1.13, 1.24)	0.94 (0.90, 0.98)	1.25 (1.19, 1.30)	1.19 (1.11, 1.28)
Major depression[e]	0.95 (0.91, 1.02)	1.14 (1.10, 1.17)	1.05 (1.02, 1.08)	1.04 (1.02, 1.09)
PTSD[e]	1.22 (1.18, 1.25)	1.09 (1.06, 1.12)	1.10 (1.08, 1.13)	1.26 (1.20, 1.32)

Reference groups for covariates:

[a] age < 40;

[b] male gender;

[c] High school;

[d] Caucasian race;

[e] patients without the specified psychiatric diagnosis;

[f] no service connection