



Prevention

Is Depression Associated with Unhealthy Behaviors among Middle-Aged and Older Women with Hypertension or Heart Disease?



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ABSTRACT

Objective: Depression is a common comorbidity in patients with cardiovascular conditions. This study aims to assess the association between comorbid depression and health-promoting behavior in middle-aged and older Australian women with hypertension or heart disease.

Methods: Data are from a subset of 45 and Up Study participants with diagnosed chronic illness ($n = 1,925$). Health behaviors including smoking status, alcohol consumption, and physical activity were assessed. Associations of depression with health behaviors in women with hypertension or heart disease were analyzed using unadjusted and adjusted (for chronic conditions and demographic measures) logistic regression models.

Results: A total of 666 women with hypertension and 220 women with heart disease were included in the analysis. In adjusted analyses, women with hypertension and comorbid depression were 2.36 (95% confidence interval, 1.02–5.46) times more likely to be risky or high-risk drinkers and 55% (adjusted odds ratio, 0.45; 95% confidence interval, 0.27–0.73) less likely to be highly physically active, compared with women without depression. Women with heart disease and comorbid depression were 65% (adjusted odds ratio, 0.35; 95% confidence interval, 0.12–0.95) less likely to be highly physically active, compared with women without depression.

Conclusions: This study provides the first data indicating that depression may be a barrier to health-promoting behavior in middle-aged and older women with hypertension or heart disease. Given that physical inactivity and risky alcohol consumption are important risk factors for aggravation of cardiologic conditions, health-promoting behaviors should be specifically targeted in the treatment of women with comorbid depression.

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Depression is a common comorbidity in both hypertension and heart disease (Carroll, Phillips, Gale, & Batty, 2010; Rudisch & Nemeroff, 2003). Depression is associated with inadequate blood pressure control and complications in patients with hypertension (Scalco, Scalco, Azul, & Lotufo Neto, 2005) as well as with higher morbidity and mortality in patients with cardiovascular disease (Barth, Schumacher, & Herrmann-Lingen, 2004; Borowicz et al., 2002; Yusuf et al., 2004). Although depression can be

considered an independent risk factor for hypertension (Meng, Chen, Yang, Zheng, & Hui, 2012), it may further have a negative impact on medication adherence (DiMatteo, Lepper, & Croghan, 2000; Gehi, Haas, Pipkin, & Whooley, 2005) and health behavior (Lasser et al., 2000; Schuch et al., 2017; Wielopolski et al., 2015). Unhealthy behavior such as smoking, high-risk alcohol consumption, and sedentary lifestyle habits are major risk factors for heart disease progression (World Health Organization, 2011; Yusuf et al., 2004) and medical guidelines strongly recommend adherence to a health-promoting lifestyle as a cornerstone of secondary prevention and risk reduction (Smith et al., 2011). Besides unhealthy diet, the World Health Organization specifically lists smoking, harmful alcohol

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consumption, and insufficient physical activity as the most important risk factors for cardiovascular disease (World Health Organization, 2011). However, adherence to health behavior recommendations is difficult for many, with studies indicating particularly low adherence among those with heart disease (Kronish et al., 2006; Whooley et al., 2008; Ziegelstein et al., 2000).

It is not yet clear whether depression normally precedes cardiovascular disease or whether it is more often a secondary symptom of cardiac events (Rumsfeld & Ho, 2005). The physiological mechanisms by which depression leads to or exacerbates cardiovascular disease include psychological stress, which, by activating the hypothalamic–pituitary–adrenal axis, increases blood pressure, left ventricular hypertrophy, coronary vasoconstriction, endothelial dysfunction, platelet activation, and the production of pro inflammatory cytokines (Dhar & Barton, 2016). As pointed out, unhealthy behavior is another major mechanism discussed in the association of depression and cardiovascular disease (Dhar & Barton, 2016; Rumsfeld & Ho, 2005).

Although some research has shown that women generally show better adherence to health-promoting behaviors than men (Miller, Sales, Kopjar, Fihn, & Bryson, 2005; Roger et al., 2012), a systematic review on the factors associated with adherence found no gender differences (DiMatteo, 2004). This finding may explain why women have an almost comparable risk for developing cardiovascular disease, compared with men (Mosca, Barrett-Connor, & Wenger, 2011). However, the absolute number of cardiovascular deaths in women exceeds that of men (Australian Institute of Health and Welfare, 2017; Benjamin et al., 2017). Whether or not comorbid depression is associated with health behavior in women with hypertension and heart disease, however, has not been examined. Therefore, this study aims to assess the association between comorbid depression and health-promoting behavior in women with hypertension or heart disease.

Methods

Study Design

A cross-sectional study design was used to obtain information from middle-aged and older women who are participants in existing cohort study (the 45 and Up Study). The information was obtained via a self-administered questionnaire.

Participants

The Sax Institute's 45 and Up Study is a population study of adults in the state of New South Wales, Australia. The 45 and Up Study is described in detail elsewhere (45 and Up Study Collaborators et al., 2008), but briefly, prospective participants were randomly sampled from the Department of Human Services (formerly Medicare Australia) enrollment database, which provides near complete coverage of the population. People 80 years of age and older and residents of rural and remote areas were oversampled. A total of 267,153 participants joined the Study by completing a baseline questionnaire (between January 2006 and December 2009), representing approximately 11% of the New South Wales population aged 45 years and over, making it the largest study of healthy aging conducted in the Southern Hemisphere. This article reports on a substudy of the 45 and Up Study. The substudy survey of this cohort occurred between September 2016 and December 2016. For this substudy 4,000

women who indicated that they had been diagnosed by a doctor as having a chronic illness—specifically depression, heart disease, hypertension, asthma, diabetes, osteoarthritis, and/or osteoporosis—were mailed a questionnaire. Of these women 2,056 (51.4%) returned the questionnaire, with 1,925 questionnaires (48.1%) being complete. The 45 and Up Study and the reported substudy have been approved by the University of New South Wales Human Research Ethics Committee and the University of Technology Human Research Ethics Committee (#2015000683).

Health Behaviors

Smoking status was defined as either nonsmoking (i.e., never smoked or not smoking now but have smoked in the past) or smoking. Based on National Health and Medical Research Council guidelines, a variable for alcohol status was derived from the frequency and quantity of alcohol consumption, comprising four categories: nondrinkers, low risk (≤ 14 drinks per week), risky (15–28 drinks per week), and high risk (> 28 drinks per week; National Health and Medical Research Council, 2001). Women were asked to report the number of times as well as the time (hours and minutes) spent in the last week walking briskly, in moderate intensity leisure activities (e.g., social tennis, recreational swimming), in vigorous leisure activity (e.g., competitive sport, running), or in vigorous household chores (i.e., that make you breathe harder or puff and pant). Responses to these questions were summed and assigned a metabolic equivalent value. Based on the metabolic equivalent value, women were categorized to indicate the overall volume of physical activity, as follows: 0 to less than 500 (inactive or low), 500 to less than 1,000 (moderately active) or 1,000 or greater (highly active) (Australian Government Department of Health, 2014).

Demographic Characteristics

Demographic measures collected in the substudy questionnaire included age, highest education qualification completed (no school certificate or other qualifications/school or intermediate certificate/high school or leaving certificate, trade/apprentice/diploma, and university degree), and marital status (single, married/de facto, and separated/divorced/widowed). As a measure of income, women were asked how they managed on their available income (it is impossible, it is difficult all the time, it is difficult some of the time, it is not too bad, and it is easy). In addition, area of residence was defined using the ARIA+ remoteness score, which uses post code to determine road distances to service centers, and thus women were categorized as residing in a major city, inner regional area, or outer regional/remote area (Australian Institute of Health and Welfare, 2004).

Statistical Analyses

For women with heart disease, three crude (or unadjusted) logistic regression models were generated: one for each of the three health behavior measures, and all having depression as the dependent variable. Further, three adjusted logistic regression models were generated: one for each of the health behavior measures, and all having depression as the dependent variable, but with adjustment for the chronic conditions, age, income, education, area of residence, and marital status. Six similar regression models were also generated for women with

Table 1
Demographic Characteristics

Demographics	Hypertension	Heart Disease	Combined
Area of residence			
Major city	45.3	42.7	44.7
Inner regional area	41.1	45.5	42.0
Outer regional or remote area	13.6	11.7	13.3
Marital status			
Married or de facto	60.4	53.2	59.9
Separated, divorced, or widowed	32.0	39.9	32.9
Single	7.6	6.9	7.2
Education			
School only or no formal education	43.1	49.3	44.5
Trade, apprenticeship, or diploma	31.4	31.6	30.7
University degree	25.5	19.1	24.8
Income (manage on available)			
No or little difficulties	60.3	60.9	61.1
Some difficulties	26.5	25.0	26.0
Struggle	13.2	14.1	12.9
Age, years	70.3 ± 8.7	74.3 ± 9.6	70.8 ± 9.0

Values are percent or mean ± standard deviation.

hypertension. All statistical analyses were undertaken using Stata 14.1 (StataCorp, College Station, TX). Statistical significance was set at a *p* value of less than .05.

Results

A total of 666 women with hypertension and 220 women with heart disease were included in the analysis. The demographic characteristics of the study sample are presented in Table 1. Overall, the prevalence of depression among these women was 31.5% for the complete sample, 34.5% for women with hypertension, and 33.2% for women with heart disease.

Hypertension

For women with hypertension, the prevalence of smoking among women with depression was 7.7%, compared with 2.1% among women without depression. Table 2 shows the association between depression and smoking status among women with hypertension. The adjusted odds ratio (AOR) is not statistically significant (AOR, 1.30; 95% confidence interval [CI], 0.40–4.28).

The prevalence of risky alcohol consumption among women with hypertension and depression was 13.5%, compared with 5.5% among women with hypertension and without depression.

Table 2

Women with Hypertension and the Association between Depression and (i) Smoking Status (Smoker or Nonsmoker), (ii) Alcohol Consumption (Risky/High Risk or No Alcohol/Low Risk), and (iii) Physical Activity Status (Inactive/Moderately Active or Highly Active)

Depression	(i) Smoking Status			(ii) Alcohol Consumption			(iii) Physical Activity Status		
	OR	95% CI	<i>p</i> Value	OR	95% CI	<i>p</i> Value	OR	95% CI	<i>p</i> Value
Yes	1.30	0.40–4.28	.663	2.36	1.02–5.46	.044	0.45	0.27–0.73	.001
No	1.00			1.00			1.00		

Abbreviations: CI, confidence interval; OR, odds ratio.

(i) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, alcohol consumption, and physical activity.

(ii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and physical activity.

(iii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and alcohol consumption.

The association between depression and alcohol consumption among women with hypertension is presented in Table 2. After adjusting for other chronic conditions and demographic characteristics, women with depression are 2.36 times (95% CI, 1.02–5.46) more likely to be risky or high-risk drinkers of alcohol, compared with women without depression.

For women with hypertension, the prevalence of high physical activity among women with depression was 40.4%, compared with 51.2% among women without depression. Table 2 shows the association between depression and physical activity among women with hypertension. Women with depression are 55% (AOR, 0.45; 95% CI, 0.27, 0.73) less likely to be highly active, compared with women without depression.

Heart Disease

The prevalence of smoking among women who have heart disease and depression was 7.1%, compared with 4.1% among women with heart disease and without depression. The association between depression and smoking status among women with heart disease is presented in Table 3. The AOR (AOR, 0.96; 95% CI, 0.13–6.94) suggests that there is no association between depression and smoking among these women with heart disease.

For women with heart disease, the prevalence of risky alcohol consumption among women with depression was 5.5%, compared with 3.4% among women without depression. Table 3 shows the association between depression and alcohol consumption among women with heart disease. The AOR (AOR, 1.90; 95% CI, 0.32–11.40) is not statistically significant, suggesting that there is no association between depression and alcohol consumption among these women with heart disease.

The prevalence of high physical activity among women who have heart disease and depression was 29.9%, compared with 42.5% among women with heart disease and without depression. The association between depression and physical activity among women with heart disease is presented in Table 3. After adjusting for other chronic conditions and demographic characteristics, women with depression are 65% less likely (AOR, 0.35; 95% CI, 0.12–0.95) to be highly active, compared with women without depression.

Hypertension and Heart Disease Combined

The prevalence of smoking among women with depression was 8.4%, compared with 2.6% among women without depression. Table 4 shows the association between depression and smoking status. The adjusted OR is not statistically significant (AOR, 1.13; 95% CI, 0.40–3.19).

Table 3
Women with Heart Disease and the Association between Depression and (i) Smoking Status (Smoker or Nonsmoker), (ii) Alcohol Consumption (Risky/High Risk or No Alcohol/Low Risk), and (iii) Physical Activity Status (Inactive/Moderately Active or Highly Active)

Depression	(i) Smoking Status			(ii) Alcohol Consumption			(iii) Physical Activity Status		
	OR	95% CI	p Value	OR	95% CI	p Value	OR	95% CI	p Value
Yes	0.96	0.13–6.94	.966	1.90	0.32–11.40	.484	0.35	0.12–0.95	.042
No	1.00			1.00			1.00		

Abbreviations: CI, confidence interval; OR, odds ratio.

(i) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, alcohol consumption, and physical activity.

(ii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and physical activity.

(iii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and alcohol consumption.

The prevalence of risky alcohol consumption among women with depression was 12.3%, compared with 5.5% among women without depression. The association between depression and alcohol consumption is presented in Table 4. After adjusting for other chronic conditions and demographic characteristics, women with depression are 2.25 times (95% CI, 1.19–4.24) more likely to be a risky or high risk drinker of alcohol, compared with women without depression.

The prevalence of high physical activity among women with depression was 41.1%, compared with 49.6% among women without depression. Table 4 shows the association between depression and physical activity. Women with depression are 53% (AOR, 0.47; 95% CI, 0.30–0.75) less likely to be highly active, compared with women without depression.

Discussion

This study examined the association between comorbid depression and important healthy lifestyle behaviors in a large cohort of women with hypertension or heart disease. Our study found that women with depression were more likely to report unhealthy behaviors, such as risky alcohol consumption and physical inactivity, compared with women without depression. This was the case regardless of their hypertension or heart disease status and is concerning, as these behaviors are known risk factors for the development and exacerbation of these cardiovascular conditions (Yusuf et al., 2004; World Health Organization, 2011). Further to this, women with hypertension and comorbid depression had less healthy behaviors than their counterparts without depression, such as levels of risky drinking and physical inactivity. There is little research showing associations of depression with unhealthy behavior in patients with hypertension. However, our study findings seem to be in line with those of another study showing associations of smoking with depression in a mixed-gender sample of hypertensive patients in Nepal (Neupane et al., 2015).

Our study identified women with heart disease and depression as less likely to engage in adequate levels of physical activity than women with heart disease without comorbid depression. This finding is in line with other studies that have demonstrated a relationship between unhealthy behavior such as lower rates of adherence to exercise and cardiovascular disease (Kronish et al., 2006; Whooley et al., 2008; Ziegelstein et al., 2000). However, in contrast with earlier studies (Kronish et al., 2006; Whooley et al., 2008), we did not find associations between smoking behavior and alcohol consumption for women with depression and heart disease. Nevertheless, adjusted ORs were greater than 1.0 for both associations, and it remains unclear whether this presents a gender effect in depression's impact on health behavior or whether the study sample was too small to detect an association. Depression is a known barrier to medication adherence in hypertension (Krousel-Wood & Frohlich, 2010) and heart disease (Gehi et al., 2005), but in the case of heart disease, physical inactivity is the main risk factor for disease progression (Whooley et al., 2008). This study provides the first data indicating that depression may also be a barrier to physical activity in women with hypertension.

Given the cross-sectional nature of our analysis, it is not possible to conclusively determine the causal relationship between depression and physical inactivity. It is likely to be a bidirectional relationship, with depression negatively impacting physical activity (Vancampfort et al., 2015; Wielopolski et al., 2015) and physical inactivity worsening depressive symptoms (Bailey, Hetrick, Rosenbaum, Purcell, & Parker, 2017; Schuch et al., 2016). Given that interventions targeting health-promoting behavior can decrease depression and cardiovascular risk factors (Bailey et al., 2017; Schuch et al., 2016; Ward, White, & Druss, 2015), interventions specifically tailored to meet the needs and abilities of women with depression are needed (Ward et al., 2015). These interventions should target specific barriers to physical activity in this patient group such as low mood, stress, and poor self-efficacy expectations (Firth et al., 2016; Vancampfort et al., 2013). Given that high alcohol

Table 4
Women with Hypertension or Heart Disease and the Association between Depression and (i) Smoking Status (Smoker or Nonsmoker), (ii) Alcohol Consumption (Risky/High Risk or No Alcohol/Low Risk), and (iii) Physical Activity Status (Inactive/Moderately Active or Highly Active)

Depression	(i) Smoking Status			(ii) Alcohol Consumption			(iii) Physical Activity Status		
	OR	95% CI	p Value	OR	95% CI	p Value	OR	95% CI	p Value
Yes	1.13	0.40–3.19	.823	2.25	1.19–4.24	.013	0.47	0.30–0.75	.002
No	1.00			1.00			1.00		

Abbreviations: CI, confidence interval; OR, odds ratio.

(i) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, alcohol consumption, and physical activity.

(ii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and physical activity.

(iii) Adjusted for chronic conditions, age, income, education, area of residence, and marital status, smoking status, and alcohol consumption.

consumption can further exacerbate hypertension (Husain, Ansari, & Ferder, 2014), increase the risk of heart disease (World Health Organization, 2011; Yusuf et al., 2004), and increase depressive symptoms, the higher prevalence of risky consumption in women with depression and hypertension also needs urgent attention.

There are limitations to our study that need consideration. This study's reliance on self-report measures creates the potential for recall bias; in particular, self-reported adherence to healthy behaviors may not necessarily be representative of the actual adherence (Jerant, DiMatteo, Arnsten, Moore-Hill, & Franks, 2008). Further, the measure of depression used in this study was also based on self-reported diagnosis by a health professional, and that may impact the validity of that data. The response rate to our survey was 51.4% and, as such, may have introduced selection bias. Furthermore, having depression may lead to an overestimation of physical activity levels and an underestimation of sedentary behavior (Vancampfort et al., 2017). Given that our sample consists of middle-aged and older women, age-related illnesses may have impacted the ability of some women to undertake high levels of physical activity. The simultaneous assessment of depression, hypertension/heart disease, and health behaviors challenges the causal interpretation of their relationship. Finally, a post hoc power analysis shows that all analyses undertaken on the combined group and the hypertension group had a minimum of 80% statistical power. However, analyses undertaken on the heart disease group had less than 80% statistical power. Therefore, caution is needed when interpreting the results of the analyses conducted on the heart disease group. Nevertheless, although previous studies have drawn on male-dominated datasets, our analysis provides the first examination of the associations of depression and health behavior in a sample composed entirely of women with cardiovascular conditions. Future studies are necessary to compare gender differences in adherence to health behavior in people with chronic illness.

Implications for Practice and/or Policy

This study indicates that depression may be a barrier to health-promoting behavior in middle-aged and older women with hypertension or heart disease. Our findings emphasize the necessity for interventions to be specifically tailored to meet the needs and abilities of women with depression. Given that high alcohol consumption can further exacerbate hypertension, increase the risk of heart disease, and increase depressive symptoms, health-promoting behaviors should be specifically targeted in the treatment of women with comorbid depression.

Conclusions

This study provides the first data indicating that depression may be a barrier to health-promoting behavior in middle-aged and older women with hypertension or heart disease. Given that physical inactivity and risky alcohol consumption are important risk factors for aggravation of cardiologic conditions, health-promoting behaviors should be specifically targeted in the treatment of women with comorbid depression. Targeted intervention programs are needed to address specific barriers in this patient group.

Declaration of Conflicting Interests

The authors declare no conflict of interest.

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