

## Research Article

# ANXIETY DISORDERS AND RISK FOR SUICIDE ATTEMPTS: FINDINGS FROM THE BALTIMORE EPIDEMIOLOGIC CATCHMENT AREA FOLLOW-UP STUDY

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*Our objective was to determine whether the presence of an anxiety disorder was a risk factor for future suicide attempts. Data were drawn from the 13-year follow-up Baltimore Epidemiological Catchment Area survey (n = 1,920). Multiple logistic regression analysis was used to determine the association between baseline anxiety disorders (social phobia, simple phobia, obsessive-compulsive disorder, panic attacks, or agoraphobia) and subsequent onset suicide attempts. The presence of one or more anxiety disorders at baseline was significantly associated with subsequent onset suicide attempts (adjusted odds ratio 2.20, 95% confidence interval 1.04–4.64) after controlling for socio-demographic variables and all baseline mental disorders assessed in the survey. These findings suggest that anxiety disorders are independent risk factors for suicide attempts, and underscore the importance of anxiety disorders as a serious public health problem. Depression and Anxiety 0:1–5, 2007. Published 2007 Wiley-Liss<sup>†</sup>.*

**Key words:** anxiety; suicide; epidemiology; comorbidity

## INTRODUCTION

Controversy exists regarding anxiety disorders as independent risk factors for suicidal behavior [Vickers and McNally, 2004; Weissman et al., 1989]. In a 35-year follow-up study of former inpatients, 20% of the patients with panic disorder had completed suicide, compared to 16.2% of patients with primary depression [Coryell et al., 1982]. Analysis of data from the epidemiologic catchment area (ECA) survey revealed that 20% of individuals with a lifetime diagnosis of panic disorder had attempted suicide [Weissman et al., 1989]. These findings subsequently led to the description of the risk of suicide in panic disorder as “substantial.” [Noyes, 1991]. This association is somewhat counter-intuitive given the hypochondriacal concerns and fear of dying that are common features of the disorder [American Psychiatric Association, 2000]. Furthermore, results from several clinical studies were not consistent with these findings. The elevated rates of suicide attempts in individuals with panic disorder seemed to be accounted for by comorbid depressive disorders, substance use disorders, or borderline personality disorder [Cox et al., 1994; Friedman et al., 1992, 1999; Mannuzza et al., 1992].

Reanalysis of the ECA data, along with a subsequent analysis of the National Comorbidity Survey (NCS) data, failed to demonstrate a significant association

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between panic disorder and suicide attempts when comorbid mental disorders were controlled for in aggregate [Hornig and McNally, 1995; Vickers and McNally, 2004]. Further complicating the relationship are results from NCS data showing that panic disorder is associated with past-year, but not lifetime, suicide attempts when adjusted for comorbid disorders [Goodwin and Roy-Byrne, 2006].

The relationship between suicide attempts and other anxiety disorders has been less studied, again with conflicting results. Analysis of ECA data revealed elevated rates of suicide attempts in both comorbid and uncomplicated obsessive-compulsive disorders [Hollander et al., 1996]. Examination of social phobia using the same data set showed that the comorbid, but not the uncomplicated cases, had significantly elevated rates of suicide attempts [Schneier et al., 1992]. In the NCS, after controlling for comorbid disorders, posttraumatic stress disorder was the only anxiety disorder significantly associated with suicide attempts [Sareen et al., 2005a]. Adding complexity to the differential associations of suicidality with specific anxiety disorders is the fact that anxiety disorders tend to cluster together within persons [Krueger, 1996; Tyrer, 1985]. Therefore, it seems appropriate from a clinical perspective to study suicide attempts among individuals with one or more anxiety disorders. In addition, although anxiety disorders have been correlated with suicidal behavior in cross-sectional studies [Kessler et al., 1999], it is of interest to study the longitudinal relationship between anxiety and suicide attempts.

Using the Netherlands Mental Health Survey and Incidence Study (NEMESIS), our group demonstrated that the presence of one or more anxiety disorders at baseline was independently associated with incident suicidal behavior over a 3-year follow-up period, after controlling for sociodemographic variables and comorbid Axis I mental disorders [Sareen et al., 2005b]. The study was limited, however, by a relatively short follow-up period (3 years), a small number of incident cases of suicide attempt (39 new cases over a 3-year period), and the exclusion of any Axis II mental disorder assessments from the survey (thus, such disorders could not be statistically controlled). As suicidal behavior is a low base-rate phenomenon, there are very few longitudinal epidemiologic data sets that have a large enough sample size to address this issue. In addition, there are few that have assessed suicidal behavior in all respondents (e.g. the Baltimore ECA study), rather than only among people who reported depressive symptoms. The Baltimore ECA follow-up study is, to date, the only other longitudinal adult survey we know of that has the capacity to examine risk factors for incident suicidal behavior. The goal of this study was to extend the literature on this topic in two specific ways. First, we utilized a longitudinal epidemiologic sample that had the advantage of a longer period of

follow-up than the NEMESIS, to examine whether a baseline anxiety disorder is a risk factor for incident suicide attempts. Second, in addition to the variables adjusted for in the previous study, this study also adjusted for the effects of antisocial personality disorder, a documented risk factor for suicidal behavior [Verona et al., 2004].

## METHODS

The ECA Program was a survey of adults in five US communities. DSM-III diagnoses were generated using the National Institute of Mental Health Diagnostic Interview Schedule (DIS); details of the ECA study design have been described elsewhere [Regier et al., 1984]. The ECA sample included both institutionalized and community-dwelling adults, and the Baltimore site was one of two sites that oversampled the elderly age group (65 years-old and older). The initial cohort of participants in the Baltimore site ( $n = 3,481$ ) was interviewed in 1981 (wave 1). A second interview occurred in 1982 (wave 2), and the initial cohort of 3,481 was then targeted for the wave 3 assessment 13 years later, between 1993 and 1996. Seventy-three percent of the original participants known to be alive were interviewed in wave 3 ( $n = 1,920$ ), using a modified version of the DIS. The waves 1 and 3 samples had approximately the same percentage of women (62 and 63%, respectively), and both samples were approximately two-thirds white race. A previous analysis has demonstrated that suicidal ideation or attempts at initial assessment were not associated with loss to follow-up [Eaton et al., 1997].

Individuals who had reported any history of suicidal ideation or suicide attempts at baseline (wave 1) were removed from the analysis, so as to capture only new cases of suicidal behavior. Next, we used Fisher's Exact Tests to compare prevalence rates of lifetime anxiety disorders (diagnosed at wave 1) among two mutually exclusive groups: individuals who had subsequent first-onset suicide attempts at the follow-up assessment (wave 3), and those that did not. The anxiety disorders assessed in the study included social phobia, simple phobia, obsessive-compulsive disorder, panic attacks, panic disorder, and agoraphobia. We created a new variable called "Any Anxiety Disorder" that included individuals who had received a diagnosis of any of the anxiety disorders, including panic attacks but excluding panic disorder. The decision to include panic attacks in the analysis as opposed to panic disorder was based on two factors. The first was previous work showing little difference between respondents with panic attacks and those with panic disorder in comorbidity burden [Kessler et al., 2006] and sociodemographic correlates and outcomes [Eaton et al., 1994]. The second factor related to questionable validity of the panic disorder diagnosis in a reappraisal study of the Baltimore site data [Anthony et al., 1985], which may in part be due

to the nature of the DSM-III panic disorder diagnosis (requiring three panic attacks in 3 weeks).

Logistic regression was used to calculate the odds of a new onset suicide attempt at wave 3 among individuals in the 'Any Anxiety Disorder' category relative to those without a baseline anxiety disorder. The rationale for using the 'Any Anxiety Disorder' category, as opposed to logistic regressions for each individual anxiety disorder, was based primarily on clinical observations and factor analyses that show that anxiety disorders often co-occur in individuals over a lifetime [Krueger, 1996; Tyrer, 1985]. Logistic regression was performed for each individual anxiety disorder (results not presented); due to power limitations and the stringency of the model, all results were non-significant. First, odds ratios were adjusted (AOR-1) for sociodemographic variables (age, gender, marital status, education). Second, odds ratios were adjusted (AOR-2) for sociodemographic variables and other baseline mental disorders (major depression, dysthymia, bipolar disorder, alcohol abuse and dependence, drug abuse and dependence, and schizophrenia). Third, odds ratios were adjusted (AOR-3) for all previous controls and antisocial personality disorder. The distinction between the AOR-2 and AOR-3 models reflects the two goals of our study, respectively: replication of previous findings [Sareen et al., 2005b] using established multivariate models [Hornig and McNally, 1995; Sareen et al., 2005b; Vickers and McNally, 2004], and extension of the model to include antisocial personality disorder.

It was also of interest to determine whether anxiety disorders are an important component of the risk factor model for new onset suicide attempts. Specifically, does the inclusion of anxiety disorders improve the statistical prediction of the model above what would be expected from the other baseline disorders (major depression, dysthymia, bipolar disorder, schizophrenia, alcohol abuse or dependence, drug abuse or dependence, and antisocial personality disorder)? The difference in  $\chi^2$  between the full model (baseline disorders plus any anxiety disorder) and the reduced model (baseline disorders only) was used to examine this question.

## RESULTS

Individuals who had first-onset suicide attempts by follow-up had higher rates of baseline anxiety disorders when compared to individuals who did not have incident suicide attempts (Table 1). Although this pattern was observed in all anxiety disorders assessed, the difference was only statistically significant among subjects with baseline panic attacks, agoraphobia, or any anxiety disorder. Notably, more than half of the individuals with first-onset suicide attempts at follow-up had a baseline anxiety disorder.

Multiple logistic regression revealed a statistically significant association between the presence of an anxiety disorder at baseline and the occurrence of a suicide attempt by follow-up, even after controlling for sociodemographic variables and Axis I comorbid mental disorders [AOR-2 = 2.23 (95% CI: 1.06–4.69)]. The association remained significant after controlling for antisocial personality disorder in the model [AOR-3 = 2.20 (95% CI: 1.04–4.64)]. Table 2 presents the results of the AOR-3 regression, listing the odds of first-onset suicide attempts at follow-up among individual baseline mental disorders.

When comparing the two models described in the Methods section regarding predicting new suicide attempts, the  $\chi^2$  difference was significant ( $\chi^2$  full model –  $\chi^2$  reduced model = 4.15 with one degree of freedom). This indicates that the inclusion of anxiety disorders statistically improves the prediction of the model with respect to new-onset suicide attempts.

## DISCUSSION

The relationship between anxiety disorders and suicidal behavior has been a controversial area. This study is an important extension of the recent finding that anxiety disorders are independent risk factors for incident suicide attempts [Sareen et al., 2005b], by demonstrating that this association remains significant even after adjusting for the effects of antisocial personality disorder. Together with data that have repeatedly shown that anxiety disorders are common mental disorders associated with substantial morbidity,

**TABLE 1. Incidence of suicide attempts in relation to baseline anxiety disorder among those at risk**

Anxiety disorder at baseline	First-onset suicide attempts by follow-up assessment		
	No suicide attempts ( <i>n</i> = 1,630) no. (%)	Suicide attempts ( <i>n</i> = 33) no. (%)	<i>P</i> -value
Social phobia ( <i>n</i> = 53)	50 (3.1)	3 (9.1)	ns
Simple phobia ( <i>n</i> = 342)	331 (20.3)	11 (33.3)	ns
Obsessive-compulsive disorder ( <i>n</i> = 48)	45 (2.8)	3 (9.1)	ns
Panic attacks ( <i>n</i> = 78)	73 (4.5)	5 (15.2)	<0.05
Agoraphobia ( <i>n</i> = 151)	143 (8.8)	8 (24.2)	<0.01
Any anxiety disorder ( <i>n</i> = 434)	417 (25.6)	17 (51.5)	<0.01

**TABLE 2. Odds of first-onset suicide attempts at follow-up among individual baseline disorders**

Disorder at baseline	Adjusted odds ratio 3 (AOR-3 <sup>a</sup> )	95% Confidence interval (CI)
Major depression	5.32	1.87–15.14
Dysthymia	0.50	0.06–4.18
Bipolar disorder	N/A	NA
Alcohol abuse or dependence	1.29	0.43–3.94
Drug abuse or dependence	0.88	0.10–7.65
Schizophrenia	0.56	0.06–5.23
Antisocial personality disorder	1.39	0.16–12.0
Any anxiety disorder	2.20	1.04–4.64

<sup>a</sup>AOR-3: variables simultaneously entered into the logistic regression include all the above mental disorders as well as sociodemographic variables (gender, age, marital status, education).

the current findings underscore their importance as a significant public health problem. Early intervention and appropriate treatment for anxiety disorders may prevent negative outcomes.

It is important to note that although anxiety disorders increased the risk for future suicidal behavior, most individuals with a baseline anxiety disorder did not show suicidal behavior. Suicide is a low base-rate phenomenon and there were only 33 new onset suicide attempts in this large sample over 13 years. In addition, this study did not examine completed suicide. Suicide attempts are an established risk factor for future completed suicide [Suominen et al., 2004], but results from this study cannot be used to make conclusions regarding the association between anxiety and completed suicide. Future psychological autopsy studies are needed to systematically assess the role of anxiety disorders in completed suicide.

These findings also raise questions as to the mechanism of association between anxiety and suicidal behavior. Although the design of this study precludes that investigation, there are several proposed mechanisms of association that may explain the relationship [Kraemer et al., 2001]. It is possible that the direct effect of distress related to anxiety symptoms may independently and directly lead to suicidal behavior. Alternatively, anxiety disorders may exert an indirect effect, increasing the likelihood of a third variable (e.g., depression, substance use) that may lead to suicidal behavior. Social anxiety [Stein et al., 2001] and other anxiety disorders [Goodwin, 2002] independently increase the likelihood of developing a depressive disorder, the latter an established risk factor for suicidal behavior. Anxiety disorders are also highly comorbid with alcohol disorders [Kushner et al., 2000] and illicit drug use [Sareen et al., 2006], and self-medication of anxiety with alcohol and drugs is significantly associated with suicidal behavior after controlling for

psychiatric comorbidity [Bolton et al., 2006]. In a third mechanistic category, common genetic or environmental factors may be associated with both anxiety disorders and suicidal behavior.

There are several limitations that warrant attention. Diagnostic assessments were carried out by lay-interviewers using structured instruments; these interviewers were suitably trained but lacked clinical training. Second, the small number of incident suicide attempts precluded the multivariate analyses to determine which of the specific anxiety disorders were associated with later suicide attempts. Third, neither posttraumatic stress disorder nor borderline personality disorder, which are both strongly linked to suicidal behavior, was assessed in this survey. Finally, the lack of inclusion of adolescents, who have relatively high rates of suicidal behavior, preclude inferences about anxiety disorders in this age group. Thus, our findings are generalizable only to adult populations. Adolescents are an important group to target for further study, given the recent finding of a significant association between suicidal behavior and depression comorbid with generalized anxiety disorder [Foley et al., 2006].

An important clinical implication of this study is that clinicians should recognize that patients with anxiety disorders are at increased risk for suicidal behavior, even in the absence of other common mental disorders. Further study is necessary to clarify this association, as well as to investigate the possibility that successful treatment of anxiety disorders reduces the incidence of suicidal behavior in this population.

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