

# Depression and Anxiety Following Aneurysmal Subarachnoid Hemorrhage Are Associated With Higher Six-Month Unemployment Rates

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Although survival has dramatically improved following aneurysmal subarachnoid hemorrhage (aSAH), the reasons for persistent high rates of unemployment in this population remain unknown. Retrospective review for medical records of patients with aSAH admitted to Rush University Medical Center was undertaken. Multivariate logistic regression models were used to test the association of either depression or anxiety with the 6-month employment status. Among the 29 patients who developed depression or anxiety, 86.2% were unemployed at 6 months following their aSAH. After controlling for confounding factors, anxiety and depression were significantly associated with higher 6-month unemployment rates (odds ratio [OR]=0.08, 95% confidence interval [CI]=0.02–0.3,  $p=0.0002$ ). Depression and anxiety are common following aSAH and are associated with increased unemployment rates 6 months post aSAH.

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While survival rates after aneurysmal subarachnoid hemorrhage (aSAH) have improved over the last two decades, only 60% of survivors eventually achieve full functional independence and only 34% return to full-time employment at 4 years.<sup>1,2</sup> The risk factors for unemployment after aSAH are not well known. The overall goal of this study is to identify predictors of successful return to full-employment status following aSAH.

## METHODS

### Data Collection

A retrospective review of medical records from a single medical center between March 2010 and November 2013 was undertaken. The study was approved by the Institutional Review Board of Rush University Medical Center. Patients' demographic and baseline characteristics were abstracted (Table 1).

### Clinical Variables

The following variables were abstracted: premorbid and 6-month postmorbid part time and full time employment status. Patients with a diagnosis of either depression or anxiety were identified. Depression and/or anxiety diagnosis was established by the primary care physician, neurologist, or psychiatrist. The severity of aSAH was classified using the Hunt and Hess grades<sup>3</sup> and the modified Fisher Scale.<sup>4</sup>

Patients who worked as volunteers or went back to school were excluded from analysis.

### Statistical Analysis

Chi-square and two-sample t tests were used to compare categorical and continuous variables, respectively. Multivariate analysis was performed using logistic regression analysis. Odds ratios and 95% confidence intervals were used for the postmorbid depression/anxiety and for Hunt and Hess grades. A  $p$  value  $<0.05$  was considered significant. All statistical analyses were performed with SAS 9.2 (SAS Institute Inc., Cary, N.C.).

## RESULTS

Between March 2010 and November 2013, 384 patients were admitted to Rush University Medical Center with a diagnosis of aSAH. Of these, 68 patients (17.7%) died during hospitalization and were excluded. Follow-up was incomplete in 1%, and the 6-month employment status was missing in 14%.

Of the remaining 316 patients, 152 (48%) were employed at the time of admission and did not have a prior history of depression or anxiety. Among these 152 patients, 66 (48.6%) did not return to work at 6 months after aSAH, and 25 of them (37.9%) had either depression or anxiety.

In a univariate analysis, the severity of bleeding ( $p=0.02$ ) and postmorbid depression ( $p<0.0001$ ) were associated with

**TABLE 1. Comparison of Baseline Characteristics and Depression/Anxiety Status Between the Employed and Unemployed at 6 Months Following Aneurysmal Subarachnoid Hemorrhage (aSAH)**

Characteristic	Unemployed 6 Months After aSAH (N=66)	Employed 6 Months After aSAH (N=64)	p
Age (years), mean (SD)	51.2 (10.1)	48.8 (11.5)	0.22
Gender, N (%)			0.5
Male	23 (34.85)	26 (40.6)	
Female	43 (65.15)	38 (59.4)	
Race/ethnicity, N (%)			0.1
White	49 (74.2)	36 (56.3)	
African American	13 (19.7)	21 (32.8)	
Other	4 (6.1)	7 (10.9)	
Education, N (%)			0.44
College	21 (31.8)	15 (23.4)	
High school diploma	16 (24.4)	9 (14)	
Post college degree	2 (3)	3 (4.6)	
Primary school	3 (4.5)	0	
Missing data	24 (36.3)	37 (57.8)	
Marital status, married, N (%)	35 (53.9)	35 (58.3)	0.61
Having family or dependent(s) (yes)	56 (88.9)	54 (91.5)	0.63
Hunt and Hess, N (%)			0.02
1	9 (13.6)	7 (10.9)	
2	22 (33.3)	33 (51.5)	
3	14 (21.2)	10 (15.6)	
4	7 (10.6)	0	
5	3 (4.5)	1 (1.5)	
Missing data	11 (16.6)	13 (20)	
Modified Fisher, N (%)			0.16
1	7 (10.6)	7 (10.9)	
2	4 (6)	6 (9.3)	
3	25 (37.8)	30 (46.8)	
4	19 (28.7)	8 (12.5)	
Missing data	11 (16.6)	13 (20)	
Postmorbid depression or anxiety, N (%)	25 (37.9)	4 (6.3)	<0.0001

increased unemployment rates at 6 months postdiagnosis. No other baseline characteristics or clinical factors were associated with the 6-month postmorbid employment status. In a multivariate analysis, postmorbid depression or anxiety was the only independent predictive factor of unemployment at 6 months (OR=0.08, 95% CI=0.02–0.3,  $p=0.0002$ ) and with Hunt and Hess grades (OR=0.55, 95% CI=0.34–0.91,  $p=0.02$ ).

## DISCUSSION

This study is the first report to show postmorbid depression/anxiety as an independent risk factor for unemployment at 6 months following the diagnosis of aSAH.

Kreutzer and colleagues reported that unemployment rate after traumatic brain injury was 67%.<sup>5</sup> However, the rationale and risk factors for unemployment are largely unknown. In our study, we found that about half of patients with aSAH who were employed before the morbidity did not return to work 6 months after diagnosis.

Exploring predictors of unemployment is essential, as any potential reversal/improvement of these factors could

represent a vertical advance in the field. It has been long hypothesized that depression/anxiety are high among survivors of aSAH. The prevalence of depression and anxiety has been estimated to be around 15% in aSAH patients 4–7 years after diagnosis.<sup>6,7</sup> However, the incidence and implication of these diagnoses have not been investigated in the past. In this study, we found that about 25% of patients have either depression or anxiety acutely after aSAH, and this was the most predicative factor for unemployment at 6 months postdiagnosis.

The major limitation of this study includes its retrospective design. Therefore, a causal relationship cannot be established with certainty. Nevertheless, the strong association between depression/anxiety and the 6-month unemployment rates represents a novel finding and warrants further evaluation in larger cohorts and prospective studies.

## CONCLUSIONS

Depression or anxiety that arise post-aSAH have an adverse effect on the employment status at 6 months after diagnosis. This represents a potential guide to rehabilitation strategies in aSAH patients. Future studies should investigate the impact of treatment of depression and anxiety on employment status in this population.

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