Clinical paper

The prevalence of psychiatric disorders in sudden cardiac arrest survivors: A 5-year nationwide inpatient analysis

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Abstract

Background: Sudden cardiac arrest (SCA) is a major public health challenge in the United States (US). At present, the existence of limited literature on psychological sequelae post-cardiac arrest is a challenge in providing optimal care to survivors.

Aim: The aim of this study is to determine the prevalence of various psychiatric comorbidities in survivors of SCA.

Methods: The National Inpatient Sample (NIS) dataset was queried to assess the prevalence of psychiatric disorders with gender-based differences and inpatient mortality among adult patients hospitalized with a previous history of SCA using ICD-9 CM codes from 2010 to 2014.

Results: Mood disorder (16.4%) was the most prevalent psychiatric comorbidity (including depression; 12.6%) followed by anxiety (10%). Cardiac arrest survivors with psychiatric disorder (CAPD) were often younger (mean 60 ± 16 vs. 64 ± 16 years; $p < 0.001$), female (53.7% vs. 38.0%; $p < 0.001$), white patients (75.9% vs. 68.7%; $p < 0.001$) and the majority were admitted non-electively (85.1% vs. 82.8%, $p < 0.001$) as compared to cardiac arrest survivors without psychiatric disorder (CANPD). Among the CAPD group, females had a significantly higher frequency of mood disorders (21.8% vs. 12.6%), depression (16.8% vs. 9.5%) and anxiety (14.2% vs. 8.0%) compared to males. The CAPD cohort had a lower all-cause in-hospital mortality (5.7% vs. 9.8%; $p < 0.001$) as compared to the CANPD group.

Conclusions: Comorbid psychiatric disorders are prevalent in SCA survivors, especially younger, white, female patients. However, CAPD did not have higher all-cause mortality as compared to CANPD. It is imperative to identify, assess, treat, and monitor high-risk SCA patients for associated psychiatric comorbidities.

Keywords: Sudden cardiac arrest, Survivors, Psychiatric disorder, Mental illness, Anxiety, Depression, Mood disorder, Gender disparities, National (Nationwide) Inpatient Sample

Introduction

Sudden cardiac arrest (SCA), a major public health challenge in the United States (US), is characterized by an abrupt cessation of cardiac activity with hemodynamic collapse. In a multinational study, the incidence rate of out-of-hospital cardiac arrests (OHCA) was 84.0 per 100,000 population.[1] Previous statistics report the annual prevalence of OHCA was 320,000–334,000 and 420,000 in Europe and the United States, respectively.[2–4] Recent improvements in survival rates for OHCA patients has been attributed to advances in research and implementation strategies for cardiac arrest care.[5] As a result, survivors having to live with long-term effects of cardiac arrest will undoubtedly rise.

While medical outcomes in survivors have been well studied, limited data exist regarding the psychological sequelae of cardiac arrest. Of the few publications that do exist, most are limited by small sample size and are conducted outside of the US. To illustrate, studies in Poland, Scotland, and the Netherlands have shown elevated rates of depression and anxiety in SCA survivors.[6–8] The European Resuscitation Council and the European Society of Intensive Care Medicine strongly advocates for the screening of emotional problems among survivors of CA.[9] Hence, a thorough understanding of mental health implications after SCA is imperative to provide optimal care to survivors. Israelsson et al. found women having higher psychological distress post-in-hospital cardiac arrest (IHCA) survival as compared to men [10]; however, the US data regarding the gender-based differences in psychiatric disorders post-SCA survival is nearly non-existent. Therefore, the primary aim of our study is to assess the prevalence of various psychiatric comorbidities in survivors of SCA with gender-based differences in the US using a nationwide database.

Table 1 – Baseline characteristics and outcomes of hospitalized patients with a previous history of cardiac arrest with and without psychiatric disorders.

Variables	History of cardiac arrest				P-value[*]
	No psychiatric disorder (N = 140,540)		Psychiatric disorder (N = 44,027)		
	N	%	N	%	
Age (years) at admission					
Mean ± SD	64 ± 16		60 ± 16		<0.001
18–44	15,344	10.9%	7,083	16.1%	<0.001
45–64	50,823	36.2%	19,604	44.5%	
65–84	62,257	44.3%	15,344	34.9%	
≥85	12,116	8.6%	1,996	4.5%	
Sex					<0.001
Male	87,082	62.0%	20,388	46.3%	
Female	53,455	38.0%	23,640	53.7%	
Race					<0.001
White	88,602	68.7%	30,322	75.9%	
African American	22,265	17.3%	5,282	13.2%	
Hispanic	9,658	7.5%	2,549	6.4%	
Asian or Pacific Islander	3,613	2.8%	490	1.2%	
Native American	646	0.5%	236	0.6%	
Other	4,205	3.3%	1,070	2.7%	
Type of admission					<0.001
Non-elective	116,110	82.8%	37,361	85.1%	
Elective	24,089	17.2%	6,552	14.9%	
Median household income quartile[a]					0.011
0–25th	36,367	26.4%	11,428	26.5%	
26–50th	35,367	25.7%	11,303	26.2%	
51–75th	33,666	24.5%	10,599	24.6%	
76–100th	32,253	23.4%	9,791	22.7%	
Primary expected payer					<0.001
Medicare	83,704	59.7%	25,625	58.3%	
Medicaid	15,406	11.0%	6,892	15.7%	
Private insurance including HMO	32,329	23.0%	8,684	19.8%	
Self – Pay/No charge/Others	8,854	6.3%	2,729	6.2%	
Outcomes					
All-cause in-hospital mortality	13,717	9.8%	2,520	5.7%	<0.001

[a] derived from https://www.hcup-us.ahrq.gov/db/vars/zipinc_qrtl/nisnote.jsp, HMO; Health Maintenance Organization.
[*] P-values ≤ 0.05 indicates statistical significance.

Methods

Data source and design

Weighted discharge data from the National (Nationwide) Inpatient Sample (NIS), the largest all-payer database in the US, was utilized for analysis. The NIS is a part of the Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality (AHRQ).[11] It contains cross-sectional data for nearly 7–8 million unweighted and 35 million weighted yearly discharges from over 1050 hospitals, which represents a 20% stratified sample of all non-federal acute care hospitals from 45 states, excluding long-term acute care and rehabilitation facilities. Each admission records one primary discharge diagnosis and up to 24 secondary diagnoses.

Study population, variables, and ethical consideration

We included all hospitalized adult ($\geq$18 years) patients with a previous history of SCA (admitted after prior arrest and survival) using previously validated ICD-9 CM code V12.53 and we quantified the prevalence of psychiatric disorders in this population using the following codes also detailed elsewhere [12]: Clinical Classification Software (CCS) code 657 (mood disorders which are inclusive of depression. ICD-9 CM codes 300.4, 301.12, 309.00, 309.1, 311 were used to identify depression separately), CCS 651 (anxiety), CCS 658 (personality disorders), CCS 659 (schizophrenia and other psychotic disorders), ICD-9 CM code 309.81 (post-traumatic stress disorder). The study was exempt from IRB approval as the NIS contains deidentified data.

Outcomes

The primary outcomes were the prevalence of psychiatric disorders among SCA survivors and gender-based differences. The secondary outcome was all-cause in-hospital mortality.

Statistical analyses

All statistical analyses were conducted utilizing appropriate survey and discharge weights in SPSS v22 (IBM Corp., Armonk, NY). Univariate analysis was conducted using a Chi-square test to compare the baseline demographics, comorbidities and categorical outcomes between SCA survivors hospitalized with psychiatric disorders (CAPD) and without psychiatric disorders (CANPD). Student's *t*-test was applied for non-categorical variables. A two-tailed p-value<0.05 was considered statistically significant.

Results

A total of 184,568 patients were admitted with a prior history of SCA and survival; of these, 44,027 (23.9%) had a concomitant diagnosis of psychiatric disorder from 2010 through 2014. Baseline characteristics of the study population are presented in Table 1. Patients in the CAPD group were more often younger (60 ± 16 vs. 64 ± 16 yrs; p < 0.001), white (75.9% vs. 68.7%; p < 0.001) females (53.7% vs. 38.0%; p < 0.001), and more often admitted non-electively (85.1% vs. 82.8%; p < 0.001) compared to the CANPD group. The CAPD cohort had lower all-cause in-hospital mortality (5.7% vs. 9.8%; p < 0.001). Mood disorder was the most prevalent psychiatric comorbidity (16.4%) (including depression; 12.6%) followed by anxiety (10%), and the least prevalent was PTSD (0.9%) (Fig. 1). Among the CAPD group, females had a significantly higher frequency of mood disorders (21.8% vs. 12.6%), depression (16.8% vs. 9.5%) and anxiety (14.2% vs. 8%) compared to males (p < 0.001) (Fig. 2).

Discussion

As post-SCA survival increases, assessing for post-SCA comorbidities is crucial in order to lower morbidity and mortality among survivors. This population-based study in the US provides the
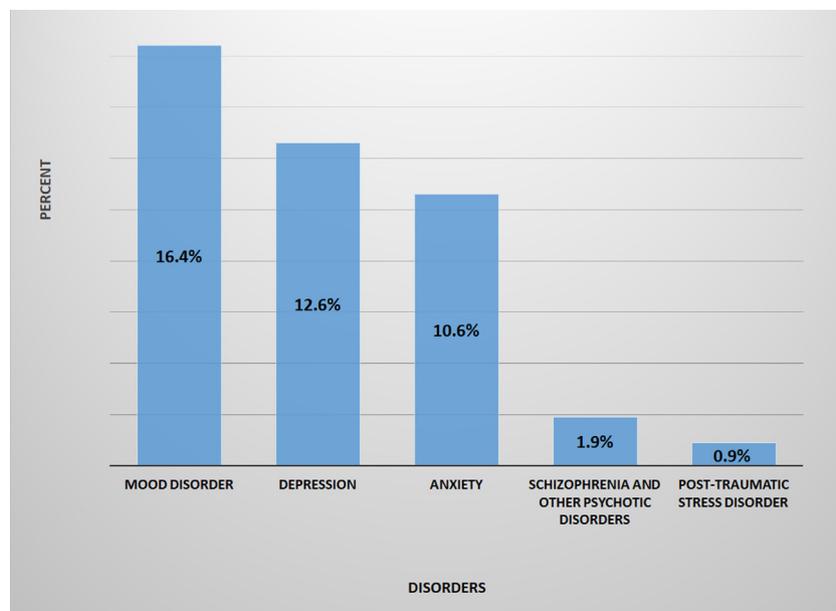

Fig. 1 – Prevalence of psychiatric disorders in cardiac arrest survivors hospitalized from 2010 to 2014 in the United States (n = 184,568).
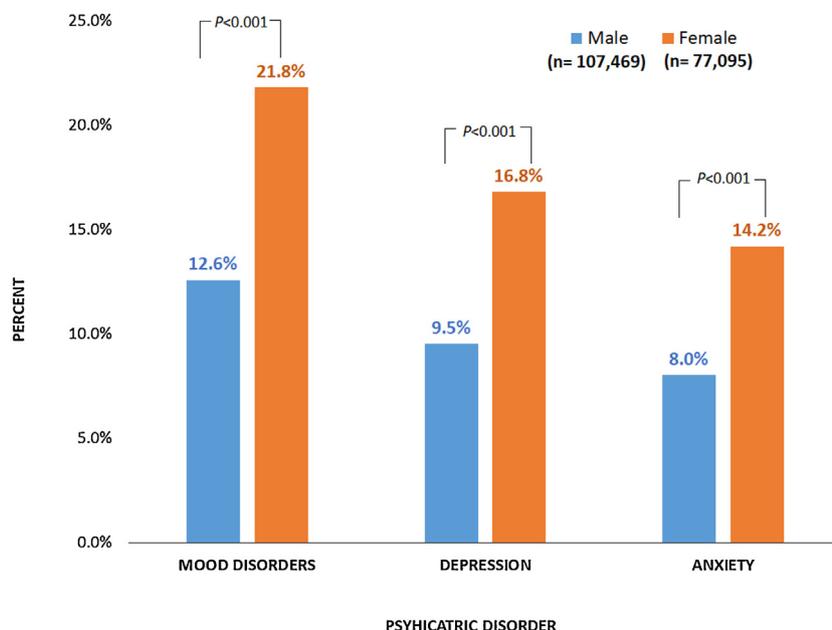
Fig. 2 – Prevalence of psychiatric disorders among cardiac arrest survivors stratified by gender.

contemporary prevalence of psychiatric comorbidities in post-SCA survivors and an assessment of their patient characteristics. The major findings of this study are: (1) Patients in the CAPD group were younger and more often white than the CANPD group. (2) Higher prevalence of post survival PD was reported among female patients. (3) The CAPD group reported higher proportion of non-elective admissions. (4) CAPD group had lower all-cause in-hospital mortality.

In this study, approximately one in four survivors (23.85%) of SCA had a psychiatric disorder. Previous research on OHCA survivors also found that a large number (38%) of survivors reported feelings of anxiety and/or depression, while 24% reported decreased quality of life even after 3 years after the incident.[8] Similarly, our study showed depression and anxiety as the most common psychiatric comorbidities in post-SCA survivors.[13] The frequency of depression and anxiety in our study was 12.6% and 10.6% respectively. In a review of prior literature, the prevalence of depression varied from 14% to 45% and anxiety from 13% to 61% in survivors of SCA, respectively.[14] Additionally, this review also reported a higher prevalence of PTSD in comparison to our study.[15] Such a high variability could be attributed to the design of study, place and time of assessment.

In corroboration with previous studies, the psychiatric burden was greater among those of younger age groups (ages 18–64 years).[15,16] A higher incidence of psychiatric comorbidities in post-SCA survivors (ages 40–59 years) compared to the general population has also been previously reported.[15] Independent predictors of anxiety disorder such as young age and implantable cardioverter- defibrillator (ICD) shock have been identified as in SCA survivors; 18% of survivors endured cardiac-related persistent fright and preoccupation with heart manifestations even with normal test results.[16] Despite the greater psychiatric burden in younger survivors, a study conducted on young (18–39 years) SCA survivors showed good functional outcomes.[17]

One of the most significant findings of our study is the higher frequency of psychiatric illness in female SCA survivors compared to males. A previous study utilizing the Swedish national registry reported a higher prevalence of psychological distress among female SCA survivors.[10] Furthermore, females are found to be more prone to depressive symptoms post-coronary revascularization.[18] Disposition of psychiatric disorder in female SCA survivors has multifactorial etiologies such as high social responsibility, increased dependence on others, and longevity as compared to males.[10] The relationship between race and psychiatric comorbidity in post-SCA patients is most significant for the white race within this study. The correlation between higher non-elective admissions in the CAPD group compared to CANPD group could be explained by higher rates of anxiety or panic disorders and aggravated reactions to other medical ailments leading to more frequent emergency visits. To corroborate, previous research shows higher anxiety-related emergency department visits among young, female, and non-Hispanic white patients with cardiovascular comorbidities.[19] The lower all-cause in-hospital mortality in the CAPD cohort in our study can be explained by the younger age of the CAPD cohort possibly contributing to fewer complications related to their psychiatric or cardiovascular conditions.

The strength of our study lies in the fact that the NIS being the largest inpatient database in the US improves the generalizability of the findings similar to our previous analysis.[20] However, a few limitations are associated with it being an administrative database; the NIS dataset requires ICD-9 CM coding and the data is collected in a visit-based manner rather than a patient-based approach so it can lead to the over or under-reporting of the disease. We could not estimate the timeline between a previous SCA event and the current hospitalization. Moreover, we could not assess the prevalence of psychiatric ailments in patients merely visiting outpatient clinics. The administrative nature of the data did not allow us to capture patient-reported measures of psychiatric disorders. Additionally, we were unable to track and provide medication-related findings, which could influence study outcome at various levels. A few patients may have had other etiologies for psychiatric disorders along with cardiac arrest, which could have interfered with the results to some extent.

Conclusions

In conclusion, this study demonstrates that nearly one-fourth of cardiac arrest survivors suffer from psychiatric disorders, mood disorders being the most common. The CAPD cohort consisted of more often female, white and younger patients showing higher rates of non-elective hospital admissions. A targeted management approach in survivors that are at higher risk of psychiatric disorders after a SCA can be beneficial.

Conflict of interest

The authors report no relationships that could be construed as a conflict of interest.

Disclosure

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