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Cocaine and Marijuana Use Among Young Adults With Myocardial Infarction

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ABSTRACT

BACKGROUND Substance abuse is increasingly prevalent among young adults, but data on cardiovascular outcomes remain limited.

OBJECTIVES The objectives of this study were to assess the prevalence of cocaine and marijuana use in adults with their first myocardial infarction (MI) at ≤50 years and to determine its association with long-term outcomes.

METHODS The study retrospectively analyzed records of patients presenting with a type 1 MI at ≤50 years at 2 academic hospitals from 2000 to 2016. Substance abuse was determined by review of records for either patient-reported substance abuse during the week before MI or substance detection on toxicology screen. Vital status was identified by the Social Security Administration's Death Master File. Cause of death was adjudicated using electronic health records and death certificates. Cox modeling was performed for survival free from all-cause and cardiovascular death.

RESULTS A total of 2,097 patients had type 1 MI (mean age 44.0 ± 5.1 years, 19.3% female, 73% white), with median follow-up of 11.2 years (interquartile range: 7.3 to 14.2 years). Use of cocaine and/or marijuana was present in 224 (10.7%) patients; cocaine in 99 (4.7%) patients, and marijuana in 125 (6.0%). Individuals with substance use had significantly lower rates of diabetes (14.7% vs. 20.4%; $p = 0.05$) and hyperlipidemia (45.7% vs. 60.8%; $p < 0.001$), but they were significantly more likely to use tobacco (70.3% vs. 49.1%; $p < 0.001$). The use of cocaine and/or marijuana was associated with significantly higher cardiovascular mortality (hazard ratio: 2.22; 95% confidence interval: 1.27 to 3.70; $p = 0.005$) and all-cause mortality (hazard ratio: 1.99; 95% confidence interval: 1.35 to 2.97; $p = 0.001$) after adjusting for baseline covariates.

CONCLUSIONS Cocaine and/or marijuana use is present in 10% of patients with an MI at age ≤50 years and is associated with worse all-cause and cardiovascular mortality. These findings reinforce current recommendations for substance use screening among young adults with an MI, and they highlight the need for counseling to prevent future adverse events. (J Am Coll Cardiol 2018;71:2540–51) © 2018 by the American College of Cardiology Foundation.

Substance abuse, including use of cocaine and marijuana, has been increasing nationally, yet its potential cardiovascular consequences are not fully understood. According to the National Institute on Drug Abuse, this increased prevalence is largely driven by a rise in marijuana use (1). Current American College of Cardiology guidelines for the management of acute coronary syndromes

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recommend that urine toxicology screening be considered when substance abuse is suspected, especially in patients <50 years of age (2). However, there are limited data on the true prevalence of substance abuse in young individuals who experience a myocardial infarction (MI).

Although it is well established that cocaine use is a strong risk factor for MI and injury through its effects on myocardial contractility and oxygen use (3), a recent meta-analysis suggests that there is insufficient evidence on the association of marijuana use with cardiovascular outcomes (4,5). However, it is known that cannabinoid receptors are present in myocardial, endothelial, and smooth muscle cells and that marijuana use has been shown to increase the generation of reactive oxygen species, decrease myocardial contractility, create a proinflammatory endothelial response, and contribute to neointimal proliferation of vascular smooth muscle. As a result, marijuana use has been suggested to be associated with adverse cardiovascular outcomes including stroke, coronary artery dissection, vasospasm, coronary thrombosis, acute coronary syndromes, arrhythmias, vasculitis, myocarditis, and cardiomyopathies (6–8).

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The recent increase in substance use among young adults and the legalization of marijuana in multiple states have led to a significant public health debate with an urgent need to understand the health effects of this substance use. Therefore, we sought to determine the prevalence of substance abuse and its association with cardiovascular outcomes in young individuals with their first MI ≤50 years of age.

METHODS

STUDY GROUP. The design of the YOUNG-MI registry has been previously described (9). This is a retrospective cohort study from 2 large academic medical centers (Brigham and Women's Hospital and Massachusetts General Hospital in Boston, Massachusetts) that included patients who experienced an MI at or before 50 years of age between 2000 and 2016. The presence and type of MI were separately adjudicated by 2 individuals. In cases of discrepancy that could not be resolved, the final determination was performed by an adjudication panel. The Third Universal Definition of Myocardial Infarction was used (10). For the present analysis, only patients with type 1 MI were included.

SUBSTANCE ABUSE. Cocaine and/or marijuana use was determined by the review of records for either patient-reported substance abuse within the week before presentation for MI or by substance detection on toxicology screen during admission for MI when the screen was obtained as part of clinical care. Electronic medical records were reviewed for clinic notes before admission, admission history and physical examination, and discharge summaries to determine patient-reported substance use. Urine toxicology screens were also reviewed when such tests were obtained as part of clinical care. Patients who used both cocaine and marijuana were included in the cocaine group for subanalyses. Opioid use was captured; however, this was limited by an inability to distinguish prescription drug use from nonprescription drug use, as well as by the

ABBREVIATIONS AND ACRONYMS

CI = confidence interval

HDL-C = high-density lipoprotein cholesterol

IPW = inverse treatment of probability weighting

MI = myocardial infarction

STEMI = ST-segment elevation myocardial infarction

the medical advisory board of General Electric Healthcare; and has received consulting honoraria from Sanofi and General Electric Healthcare. Dr. Bhatt is on the advisory boards of Cardax, Elsevier Practice Update Cardiology, Medscape Cardiology, and Regado Biosciences; is on the board of directors of the Boston VA Research Institute and the Society of Cardiovascular Patient Care; is chair of the American Heart Association Quality Oversight Committee; is on the data monitoring committees of the Cleveland Clinic, Duke Clinical Research Institute, Harvard Clinical Research Institute, Mayo Clinic, Mount Sinai School of Medicine, and Population Health Research Institute; has received honoraria from the American College of Cardiology (senior associate editor, *Clinical Trials and News,* acc.org; vice-chair, American College of Cardiology accreditation committee), Belvoir Publications (Editor-in-Chief, *Harvard Heart Letter*), Duke Clinical Research Institute (clinical trial steering committees), Harvard Clinical Research Institute (clinical trial steering committee), HMP Communications (Editor-in-Chief, *Journal of Invasive Cardiology*), *Journal of the American College of Cardiology* (guest editor; associate editor), Population Health Research Institute (clinical trial steering committee), Slack Publications (chief medical editor, *Cardiology Today's Intervention*), and the Society of Cardiovascular Patient Care (secretary/treasurer), WebMD (CME steering committees); is deputy editor of *Clinical Cardiology;* is chair of the NCDR-ACTION Registry Steering Committee and the VA CART Research and Publications Committee; has received research funding from Abbott, Amarin, Amgen, AstraZeneca, Bristol-Myers Squibb, Chiesi, Eisai, Ethicon, Forest Laboratories, Ironwood, Ischemix, Lilly, Medtronic, Pfizer, Roche, Sanofi Aventis, and The Medicines Company; has received royalties from Elsevier (editor, *Cardiovascular Intervention: A Companion to Braunwald's Heart Disease*); is a site co-investigator for Biotronik, Boston Scientific, and St. Jude Medical (now Abbott); is a trustee of the American College of Cardiology; and has conducted unfunded research for FlowCo, Merck, PLx Pharma, and Takeda. Dr. Blankstein has served on the advisory board of Amgen; and has received research support from Amgen, Sanofi, and Gilead Sciences. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose. Joseph Alpert, MD, served as Guest Editor for this paper. Presented on March 18, 2018, at the American College of Cardiology 2018 Scientific Sessions.

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