Published in final edited form as:
Am J Cardiol. 2008 October 15; 102(8): 966–969. doi:10.1016/j.amjcard.2008.06.016.

Prevalent Cocaine Use and Myocardial Infarction

Stella Aslibekyan, SM[a,b], **Emily B. Levitan, ScD**[b], and **Murray A. Mittleman, MD, DrPH**[a,b]

a *Harvard School of Public Health, Department of Epidemiology, Boston, MA, USA*

b *Cardiovascular Epidemiology Research Unit , Department of Medicine, Beth Israel Deaconess Medical Center, Boston, MA, USA*

Abstract

Studies have reported a possible link between cocaine use and risk of cardiovascular events. We examined the association between self-reported cocaine use and physician diagnosed myocardial infarction (MI) in the Third National Health and Nutrition Examination Survey (NHANES III) conducted from 1988–1994. We estimated odds ratios (OR) using logistic regression models adjusted for age and additionally for sex, race, and other MI risk factors, which accounted for the complex sampling design. In the 18–59 age group, there was no statistically significant association between any exposure to cocaine and MI (age-adjusted OR = 1.56, 95% confidence interval (CI): 0.44– 5.50, *p*-value= 0.48, multivariate-adjusted OR = 1.06, 95% CI: 0.30– 3.73, *p*-value= 0.92). Participants who reported using cocaine >10 times had a non-significant higher prevalence of MI (age-adjusted OR = 3.13, 95% CI: 0.80- 12.25, *p*-value= 0.10, multivariate-adjusted OR = 1.84, 95% CI: 0.46–7.29, *p*-value= 0.40). However, participants aged 18–45 who reported >10 occasions of cocaine use had a significantly elevated prevalence of MI in age-adjusted models (OR= 4.60, 95% CI: 1.12–18.88, *p*-value= 0.035). The association was attenuated in multivariate-adjusted models (OR = 3.84, 95% CI: 0.98– 15.07, *p*-value= 0.054). The lifetime prevalence of cocaine use increased from 14% in NHANES III to 19% in NHANES 2005–2006. In conclusion, these data support a substantial association between cocaine use and MI; the temporal trend in cocaine use may increase the occurrence of MI, particularly among younger populations.

Keywords

cocaine; myocardial infarction; attributable risk

Introduction

Since the Third National Health and Nutrition Examination Survey (NHANES III) was conducted, cocaine use in the USA has become an increasingly important public health concern, with the number of cocaine-related emergency department visits growing by 35%, from approximately 143,000 in 1994 to 193,000 in 2001. (1) Recent publication of a Scientific Statement by the American Heart Association has drawn considerable attention to the impact of cocaine use on cardiovascular health. (2) In this report, we reexamine data from NHANES III and recently released data from NHANES 2005–2006 to further elucidate the cross-sectional association between self-reported cocaine use and myocardial infarction (MI) and to examine temporal trends in its use.

Corresponding author:Murray A. Mittleman MD DrPH, (617) 632-7653, mmittlem@hsph.harvard.edu, Cardiovascular Epidemiology Research Unit, Beth Israel Deaconess Medical Center, 375 Longwood Avenue, room 423, Boston, MA 02215.

Methods

NHANES III was a nationally representative cross-sectional survey conducted by the National Center for Health Statistics from 1988 to 1994. It included 39,695 participants aged 2 months and older, sampled from the total civilian non-institutionalized population of the United States. NHANES 2005–2006 was a nationally representative cross-sectional survey that was designed based on the previous NHANES survey cycles and conducted by the National Center for Health Statistics. It included 10,348 participants of all ages, sampled from the total civilian non-institutionalized population of the United States. In both surveys, data were obtained through home interviews, medical examinations, and laboratory tests. Sampling weights were calculated by the National Center for Health Statistics to account for oversampling of specific subgroups (e.g. the minorities and the elderly), noncoverage, and non-response. (3)

Participants were asked: "Has a doctor ever told you that you had a heart attack?" If no response was available, participants were considered as not having a prior MI. NHANES III data on street drug use was obtained during the medical examination, using a questionnaire restricted to persons aged 18–59 years. Participants were asked about lifetime cocaine use and given the choice between the following options: never, <10 times, 10–100 times, >100 times. In NHANES 2005–2006, data on lifetime cocaine use was obtained only among participants aged 20–59 years during the medical examination. Participants were asked about lifetime cocaine use. Those who answered affirmatively were asked a follow-up question on frequency of lifetime use and given a choice between the following options: once, 2–5 times, 6–19 times, 20–49 times, 50–99 times, and >100 times. If no data was available on lifetime frequency of cocaine use, participants were considered non-exposed. Participants who did not attend the medical examination portion of the survey were excluded from the analysis. In the NHANES III data set, 11,993 (92%) of 13,022 participants in the 18–59 age group attended the examination. In the 18–45 age group, 9,337 participants of 10,085 (93%) attended the examination. In the NHANES 2005–2006 data set, 3,846 (96%) of 3,993 participants in the 20–59 age group and 2,912 (96%) of 3,036 participants in the 20–45 age group attended the examination.

Two separate analyses were conducted for the NHANES III data, one among participants aged 18–59 years and a secondary analysis restricted to the 18–45 age group for comparability with previous analyses. (4) Chi-squared tests and linear regression were used to compare characteristics according to frequency of cocaine use. Age-adjusted and multivariate logistic regression analyses were used to estimate the association between self-reported lifetime cocaine use and the prevalence of reported MI in both age groups. Both the age-adjusted and the multivariate model controlled for age using a linear term. All of the described logistic regression models were fit both with the 6-year survey weights for the medical examination center and complex sampling methods. The multivariate logistic regression model included age, sex, race (white vs. non-white), education level (<12 vs. ≥12 years of formal education), diabetes, hypertension, hyperlipidemia, and health insurance status (any medical insurance coverage vs. none). Prevalence of cocaine use in each age group was estimated using 6-year survey weights for the medical examination center among the NHANES III participants and using 2-year survey weights for the medical examination center among the NHANES 2005–2006 participants. Population attributable risk percentages (PAR%) were calculated using the following formula, where OR is the multivariate-adjusted odds ratio. (5) PAR%= [[(OR-1)/OR]*(number of exposed cases/number of total cases)]*100 All statistical analyses were performed using Stata v.10 (College Station, TX).

Results

The clinical characteristics of the study population are summarized in Table 1. Cocaine use in the 18–59 age group was significantly associated with age, male gender, lack of medical insurance, hyperlipidemia, and a history of smoking. (Table 1)

The small number of participants who reported an MI and using cocaine 1–10 times in their lifetime precluded further analysis of this subgroup. In this population, there was no statistically significant association between any exposure to cocaine and MI. (Table 2) Participants who reported using cocaine > 10 times had a 3-fold higher prevalence of MI, although the result was not significant. The multivariate model produced attenuated estimates of MI prevalence for both users vs. non-users and for frequent users vs. non-users. When the population was restricted to participants 18–45 years of age, participants who reported any exposure to cocaine were twice as likely to report an MI, but the result was not statistically significant. Adjusted for age, participants aged 18–45 who reported > 10 lifetime exposures to cocaine had a significantly higher prevalence of MI compared to non-users. Further adjustment for potential confounders attenuated the association between self-reported cocaine use and MI in that age group, and the association was no longer statistically significant.

Among NHANES III participants aged 18–59, the weighted prevalence of lifetime cocaine exposure was estimated at 14% (95% CI: 12–15%). If the population was restricted to the 18–45 age group, the weighted prevalence of lifetime cocaine use increased to 17% (95% CI: 15–18%). In the NHANES 2005–2006 data set, the weighted prevalence of lifetime cocaine use was 19% in both the 20–59 age group (95% CI: 18–21%) and the 20–45 age group (95% CI: 17–21%). Our calculation of the PAR% shows that among 18–45 year old NHANES III participants, 10.2% of nonfatal MI cases were associated with > 10 lifetime occurrences of cocaine use.

Discussion

Among the NHANES III participants who reported using cocaine in the 18–59 age group the prevalence of MI was somewhat elevated, but these results were not statistically significant. When the population was limited to participants in the 18–45 age group, self-reported cocaine use of > 10 lifetime instances was significantly associated with an increased prevalence of MI. A comparison of ever users vs. non-users suggested that the prevalence of MI was non-significantly elevated in the 18–45 year age group, but not in the 18–59 year age group. The wide 95% confidence intervals around the estimated OR are related to the low number of cases in the study population. Adjustment for multiple covariates attenuated the association across age groups and frequency of use. In this nationally representative population, approximately 10% of the MIs among those 18–45 years of age are associated with a history > 10 lifetime episodes of cocaine use. The weighted prevalence of lifetime cocaine use has increased from 14% in the 18–59 age group and 17% in the 18–45 group in the NHANES III data to 19% in both the 20–59 and the 20–45 age group among NHANES 2005–2006 participants. Due to the low number of exposed participants in the 2-year NHANES 2005–2006 cycle and thus limited statistical power, further analyses were not conducted in that population.

These results are not completely consistent with the prior analysis published by Qureshi *et al*., in which cocaine use on > 10 lifetime occasions was associated with a substantially higher prevalence of MI in the 18–45 age group (multivariate OR= 6.9, 95% CI: 1.3– 58). The discrepancy in the estimates may be explained by methodological differences between the two analyses. First, Qureshi et al. do not mention the way in which the National Center for Health Statistics survey weights and complex sampling methods have been incorporated into their regression models. The survey weights are designed to account for the complex sampling

scheme of the NHANES and are crucial for ensuring the accuracy of the estimates. (3) Second, Qureshi *et al*. limit their analysis to the 18–45 year age group, citing the low number of exposed participants between the ages of 46 and 59. Finally, the PAR% formula used by Qureshi *et al*. is poorly suited for use when the OR is the effect measure estimated. Their estimate that 25% of MIs in the 18–45 age group were caused by > 10 lifetime occasions of cocaine use is not plausible given that only 13% of cases were exposed.

A major strength of this study was the nationally representative population. However, this study has a number of important limitations. NHANES III was a cross-sectional survey; by design only physician diagnosed cases of MI were included. Another limitation of this work is the small number of prevalent cases of MI in the NHANES III study, which yields relatively low statistical power. We do not know the accuracy of reporting of either cocaine use or MI. In particular, as cocaine use is stigmatized and illegal, underreporting of both cocaine use and its frequency is likely. (6–8) Finally, NHANES III was conducted more than 10 years ago, and the 2000–2004 NHANES survey cycles have not contained comparable questions on cocaine use and other survey data reporting on cocaine use have not collected data on MI.

Recent national survey data confirm the growing importance of cocaine use as a public health issue in the United States. Since NHANES III was conducted, the prevalence of lifetime cocaine use has increased by approximately 30%, reaching 14.7% of all Americans 12 years of age and older in 2003. (9,10) In the 2005–2006 NHANES data set, the national prevalence of lifetime cocaine use was estimated at 19%. This increase is likely to be explained by the different age distributions in the survey populations. Specifically, the 2005–2006 NHANES data was restricted to the 20–59 age group, which is likely to have a higher prevalence of lifetime cocaine use than the population 12 years of age and older included in the National Household Survey on Drug Abuse. Although the incidence of cocaine use declined from its peak in 1983 until 1992, it has since increased, and there were an estimated 0.9 million new users in 2000. (11) Additionally, the number of emergency department visits related to cocaine use has been growing steadily over the past decade. (1) These trends emphasize the need for current data from large-scale studies on the association between cocaine use and adverse cardiovascular events in order to quantify its public health burden.

Acknowledgements

EBL was supported by National Institutes of Health grants T32 HL 7374 and F32 HL091683.

References

1. Substance Abuse and Mental Health Services Administration. Emergency Department Trends From the Drug Abuse Warning Network: Final Estimates 1994 – 2001 (DHHS Publication No. SMA 02–3635, DAWN Series D-21). Rockville, MD: Department of Health and Human Services; 2002. Office of Applied Studies; p. 53
2. Cord J, Jneid H, Hollander JE, de Lemos JA, Cercek B, Hsue P, Gibler WB, Ohman EM, Drew B, Philippides G, Newby LK. Management of cocaine-associated chest pain and myocardial infarction: a scientific statement from the American Heart Association Acute Cardiac Care Committee of the Council on Clinical Cardiology. Circulation 2008;117:1897–1907. [PubMed: 18347214]
3. Analytic and reporting guidelines: The National Health and Nutrition Examination Survey (NHANES). Hyattsville, MD: National Center for Health Statistics; 2006. p. 6-7.
4. Qureshi AI, Suri MF, Guterman LR, Hopkins LN. Cocaine use and the likelihood of nonfatal myocardial infarction and stroke: data from the Third National Health and Nutrition Examination Survey. Circulation 2001;103:502–506. [PubMed: 11157713]
5. Miettinen OS. Proportion of disease caused or prevented by a given exposure, trait or intervention. Am J Epidemiol 1974;99:325–332. [PubMed: 4825599]

6. Morral AR, McCaffrey D, Iguchi MY. Hardcore drug users claim to be occasional users: drug use frequency underreporting. Drug Alcohol Depend 2000;57:193–202. [PubMed: 10661670]

7. Fendrich M, Johnson TP, Sudman S, Wislar JS, Spiehler V. Validity of drug use reporting in a high-risk community sample: a comparison of cocaine and heroin survey reports with hair tests. Am J Epidemiol 1999;149:955–962. [PubMed: 10342805]

8. Hser YI, Maglione M, Boyle K. Validity of self-report of drug use among STD patients, ER patients, and arrestees. Am J Drug Alcohol Abuse 1999;25:81–91. [PubMed: 10078979]

9. Drug Abuse and Mental Health Administration. National Institute on Drug Abuse. National Household Survey on Drug Abuse: Main Findings 1988 (DHHS Publication No. ADM 90–1682). Rockville, MD: Department of Health and Human Services; 1991. p. 56

10. Substance abuse and Mental Health Services Administration. Results from the 2004 National Survey on Drug Use and Health:National Findings (DHHS Publication No. SMA 05–4062, NSDUH Series H-28). Rockville, MD: Department of Health and Human Services; 2005. Office of Applied Studies; p. 105

11. Substance Abuse and Mental Health Services Administration. Results from the 2001 National Household Survey on Drug Abuse: Volume 1. (DHHS Publication No. SMA 02–3758, NSDHA Series H-17). Rockville, MD: Department of Health and Human Services; 2002. Office of Applied Studies; p. 45

Table 1

Characteristics of the Third National Nutrition and Health Examination Survey participants who completed the exam.

	18–59 age group				18–45 age group			
Lifetime occasions of cocaine use	**>10 (n=557)**	**1–10 (n=769)**	**0 (n=10,667)**	***p*-value**	**>10 (n=532)**	**1–10 (n=731)**	**0 (n=8,074)**	***p*-value**
Mean age (standard deviation)	33.6 (7.3)	31.6 (7.9)	36.0 (11.8)	<0.0001	32.8 (6.5)	30.6 (6.8)	30.8 (8.1)	0.0004
Male	375 (67%)	453 (59%)	4,696 (44%)	<0.0001	355 (67%)	430 (59%)	3,500 (43%)	<0.0001
Non-white	272 (49%)	259 (34%)	3,921 (37%)	0.06	257 (48%)	244 (33%)	3,129 (39%)	0.01
Education, <12 years	159 (29%)	255 (33%)	3,659 (34%)	0.95	147 (28%)	243 (33%)	2,615 (32%)	0.58
No medical insurance	184 (33%)	242 (31%)	2,954 (28%)	<0.0001	175 (33%)	232 (32%)	2,443 (30%)	0.001
Hypertension	118 (21%)	133 (17%)	2,431 (23%)	0.06	108 (20%)	117 (16%)	1,311 (16%)	0.03
Hyperlipidemia *	175 (31%)	268 (35%)	4,444 (42%)	<0.0001	164 (31%)	250 (34%)	2,764 (34%)	0.14
Diabetes mellitus	19 (3%)	17 (2%)	504 (5%)	0.21	16 (3%)	12 (2%)	240 (3%)	0.34
Smoking				<0.0001				<0.0001
Current	347 (62%)	386 (50%)	2,899 (27%)		329 (62%)	367 (50%)	2,146 (27%)	
Former	114 (20%)	157 (20%)	1,857 (17%)		110 (21%)	146 (20%)	1,078 (13%)	
Never	96 (17%)	226 (29%)	5,911 (55%)		93 (17%)	218 (30%)	4,850 (60%)	
Myocardial infarction	7 (<1%)	4 (<1%)	152 (1%)	0.14	6 (<1%)	1 (<1%)	36 (<1%)	0.008

* defined by a fasting serum cholesterol level >200 mg/dL or by self-reported use of antilipemic medication

Table 2

Association between cocaine use and myocardial infarction in Third National Health and Nutrition Examination Survey participants, stratified by age group and lifetime frequency of use.

	18–59 years		18–45 years	
	OR (95% CI)	***p*-value**	**OR (95% CI)**	***p*-value**
Ever users vs. never users				
Age-adjusted	*1.56 (0.44, 5.50)*	*0.48*	*2.28 (0.56, 9.21)*	*0.24*
Multivariate-adjusted*	*1.06 (0.30, 3.73)*	*0.92*	*1.77 (0.47, 6.75)*	*0.39*
>10 instances of use vs. never users				
Age-adjusted	*3.13 (0.80, 12.25)*	*0.10*	*4.60 (1.12, 18.88)*	*0.04*
Multivariate-adjusted*	*1.84 (0.46, 7.29)*	*0.40*	*3.84 (0.98, 15.07)*	*0.05*

* adjusted for age (continuous), sex, race (white vs. non-white), medical insurance status (any insurance coverage vs. none), education (<12 years vs. ≥ 12 years), smoking (current vs. past vs. never), history of diabetes mellitus, hyperlipidemia, and hypertension