Crack Cocaine Use and Mortality Risk: A Follow-Up Study on 178 Individuals in Drug Treatment for Crack Cocaine Problems

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SUMMARY

Background: In Europe, crack cocaine use is mainly observed in vulnerable and marginalized groups, many of whom have other substance use problems, including heroin-related problems.
Objectives: To examine mortality risk and causes of death in a cohort of crack users.
Methods: We performed a follow-up study to assess mortality in a cohort of patients who entered drug treatment for crack cocaine problems in the metropolitan area of Bologna (Northern Italy) from 1992 to 2020.
Results: Most of participants were polydrug users, 75% reported concomitant heroin, 55% cocaine and 24% alcohol use; 43% have injected a substance. Mortality was six times higher than in the general population, and overdose and infectious diseases were among the leading causes of death.
Conclusions: Longitudinal epidemiological studies are needed to systematically assess the health outcomes of crack cocaine use.

Keywords: Crack; Cocaine; Mortality; Cohort study; Public Treatment Centre for Addiction.

INTRODUCTION

Cocaine is available in Europe mainly in two forms: cocaine hydrochloride, a salt often referred to as 'cocaine powder' that can be snorted, swallowed or injected; and 'crack cocaine', which has been processed into a freebase form using cocaine hydrochloride as the starting material and can be smoked, swallowed or injected.

While cocaine powder has been used for decades, crack cocaine (crack) emerged as a sub-type in the 1980s [1]. Crack use is often characterized by high-frequency consumption, leading to mental and physical health problems and aggressive behaviour, making the delivery of treatment and harm reduction responses challenging [2]. As with other illegal drugs, crack use crosses social strata but is particularly associated with poverty, homelessness, incarceration and limited access to or uptake of health and social services [3].

The high availability of cocaine is likely to have contributed to increased levels of crack use in western and southern Europe. In Europe, crack use is mainly observed in vulnerable and marginalized groups [4], many of whom have other substance use problems, including heroin-related problems [5, 6]. Crack injection, often in combination with heroin, is common in England and Wales, with 52% of people who inject drugs reporting recent crack injection in 2020–21 [7].

Long-term trends point to an estimated 7000 clients entering drug treatment for crack problems in Europe in 2020, which is triple the number reported in 2016 and suggests its growing use [2]. The proportion of crack among cocaine as primary substance treatment entrants varied considerably: Italy 3,4%, Switzerland 8,1%, Ireland 11,8%, Spain 12,9%, France 30,8%, Belgium 32,3%, England 34%, The Netherlands 37,1% [8].

In Italy, while the number of crack users received in treatment centres increased by 378% from 2014 to 2022 (905 in 2014; 3417 in 2022), the total number of clients entering treatment for drug problems

decreased by 6% [9]. The estimated number of crack users aged 15–64 years is believed to have tripled in France from 2010 to 2017, with prevalence below 1‰ [10], while in England in 2016/2017 it was around 5‰ [11]. A 2021 analysis of municipal wastewater in 13 European cities found crack residues in all cities on all sampling days [12], while 13% of patients presenting to 22 emergency departments in 14 European countries with acute cocaine toxicity were crack consumers [13].

It should however be noted that the label "crack user" is profoundly stigmatizing and people entering drug treatment with less risky cocaine use profiles, not using other stimulants, with high socioeconomic level, have higher odds of using the less stigmatizing "smoked cocaine" [14].

Pipes used for crack cocaine smoking are often homemade and/or in short supply, leading to pipe sharing and injuries from use of unsafe materials. This increases risk of viral infection and respiratory harm among a marginalised underserved population [15]. Crack injection is associated with elevated blood-borne virus (HCV, HIV) and bacterial infection risk [16], given increased injection frequency compared to opioid use [17].

Meta-analyses showed positive associations between crack use and blood/sexually transmitted diseases (HIV, hepatitis C virus [HCV], etc.); and moderate evidence and meta-analyses supported associations with neonatal health and violence. There were mixed associations for mental and other health outcomes, yet insufficient evidence to perform meta-analyses for mortality. Most underlying research was of limited or poor quality, with crack commonly assessed as a secondary covariate [18].

From reviews, elevated all-cause crude mortality rates (CMR = 12.4 per 1000 person-years) and standardized mortality ratios (SMR = 6.3) among people with regular or problematic cocaine use have emerged. Drug-related, suicide, accidental injury, homicide and AIDS-related mortality were all elevated compared with age- and gender-matched peers in the general population [19]. Mortality risk and excess mortality were significantly greater among those with cocaine and heroin use disorder than among people with only cocaine use disorder or cocaine and alcohol use disorder [20]. In the only two follow-up studies, individuals arrested for crack use [21] and crack-dependent patients [22, 23] experienced 5-fold and 12-fold elevated mortality rates, respectively, compared to the general population. Homicide, overdose and AIDS were the main causes of death [24].

The aim of this retrospective cohort study, which targeted residents of the Emilia-Romagna region (North Italy) who turned to a Public Treatment Centre for Addiction (PATS) following problems due to crack use between 1992 and 2020, was to examine mortality risk and causes of death in the Emilia-Romagna region. We estimated overall mortality rates and excess mortality by age and gender.

MATERIALS AND METHODS

People residing in the Emilia-Romagna Region (Northern Italy) aged 18 years and older who entered drug treatment for crack problems were enrolled. The reference period was between 01/01/1992 and 31/12/2020 and the territory was the metropolitan area of Bologna. The cases were selected from the IT systems of 10 PATS. All information was obtained retrospectively.

At the PATS, a digital regional folder was used to collect the data at first admission, as well as personal data, health data, treatments undertaken and substances of use (including crack).

The information was collected at first contact. Variables related to age, gender, country of birth, residence, social situation (homeless, imprisonment), professional condition, marital status, educational degree, health situation (HIV positive, HCV positive), substance of use and date of first admission were used.

Person-years (PY) were calculated from the first documented episode to 31 December 2020 or up to the date of death. Based on the ICD-9 (until 2002) and ICD-10 (from 2003) codes, mortality was verified at the registry offices of the municipality where the patients were living at the end of the study period (i.e. 31 December 2020) or at death. Patients who were lost to follow-up were included in PY until the date they moved out of their last known stable place of residence.

Continuous and categorical variables were analysed with Student's t-test and the chi-squared test, respectively. CMRs per 1000 person-years and relative confidence intervals (CIs) at 95% were calculated. To compare the mortality rates of crack patients with those of the general population, we calculated the SMRs, adjusted for gender, age and calendar year (standard: Emilia-Romagna region), and the relative 95% CIs.

Data analyses were performed using STATA 15.1 statistical software.

The study protocol was approved by the local research ethics committee (Cod. CE:201 83).

RESULTS

The cohort was made up of 178 subjects, 24 (13%) female and 48 (28%) non-natives: 26 (15%) Mediterranean African, 11 (6%) Eastern Europe, 6 (3%) other European countries. One hundred and twenty-seven people (73%) were unmarried, 16 (9%) were widowed, separated or divorced, 26 (15%) were homeless, 57 (32%) had been to prison at least once, 134 (77%) did not finish a high school/university degree and 93 (53%) were unemployed. Among the females, a lower percentage of non-natives and a higher quota of those with a high school degree were observed.

Furthermore, 37 (21%) were HCV positive and 6 (3%) were HIV positive, 138 (77%) smoking crack and 40 (23%) injecting crack with an average age at first admission of 35 years. (Table 1).

In the entire period, 131 (75%) reported concomitant heroin use, 96 (55%) cocaine, 42 (24%) alcohol, 29 (17%) cannabis, 11 (6%) benzodiazepines, 7 (4%) barbiturates, 6 (3%) amphetamines and 5 (3%) hallucinogens; almost 76 (43%) have injected a substance.

The average period of contact with the PATS was 4.3 years. By the end of the follow-up, 52 (29%) had completed the therapeutic programme and had been dismissed, 57 (32%) had an ongoing therapeutic programme, 56 (31%) had already left treatment, 8 (5%) were arrested and 5 (3%) died during the treatment programme.

Follow-up continued until 31 December 2020 or the date of death for 96% of the subjects (eight subjects were lost to follow-up). The average follow-up period was 7.6 years. There were 1355 PY (145 females, 1210 males). Nine patients (5% of the whole cohort) died, all males (6% of men). The mean age at death was 48.1 ± 8 years.

Proportional mortality

There was one death of ill-defined or unknown causes. The main causes of death were external causes (2, heroin overdose; 1, suicide), infectious diseases (1, viral hepatitis; 1, AIDS), all tumours (1, malignant neoplasm of oesophagus; 1, malignant neoplasm of liver and intrahepatic bile ducts) and digestive system disease (1, gastritis and duodenitis).

Mortality rates

The CMR was 6.6 (95% CI = 3.5–12.8) per 1000 person-years, increasing with age.

Regarding the causes of death, the CMR was higher for external, followed by infectious diseases and all tumours (Table 2).

Mortality rates were higher among Italian-born patients (natives: CMR = 7.3, 95% CI = 3.7–14.6; non-natives: CMR = 3.8, 95% CI = 0.5–27.1), individuals with a low school degree (primary/secondary school: CMR = 7.5, 95% CI = 3.7–14.9; high school diploma/university: CMR = 3.5, 95% CI = 0.5–25.2), patients using alcohol (using alcohol: CMR = 8.5, 95% CI = 2.7–26.3; not using alcohol: CMR = 6.0, 95% CI = 2.7–13.3) and patients injecting any substance (injecting: CMR = 7.6, 95% CI = 3.4–16.9; not injecting: CMR = 5.3, 95% CI = 1.7–16.4).

It should be noted that there was no difference in mortality rates between patients using (CMR = 6.7, 95% CI = 3.4–16.9) and not using heroin (CMR = 6.7, 95% CI = 3.2–14.1).

Standardized mortality ratios

SMRs were at least six times higher among males and thirteen times higher among patients aged 35–44 years. Elevated and statistically significant SMRs were found for any single cause of death (Table 2).

DISCUSSION

This study targeted a cohort of people who accessed health services following problems caused by crack use, many of whom reported concomitant heroin and alcohol use, and results confirmed what has been reported in the literature concerning the characteristics [3, 5, 6, 20] and the elevated mortality risk connected to crack cocaine use [18, 21, 22, 23, 25].

From studies crack-cocaine use was associated with a range of health outcomes, although it was unclear if there was direct causal impact, interactions between risk factors, or external drivers of both crack-cocaine use and outcomes [18].

The cohort, composed of 178 individuals who turned to a public addiction service for problems due to crack use over a 30-year period, is distinguished by specific demographic (non-natives, most from Mediterranean African countries) and socio-economic (low education, unemployed) characteristics, social marginalization (homeless, imprisonment) and particular physical (HIV, hepatitis) problems. Many of them have injected a substance; heroin, cocaine and alcohol were the other principal substances used. It should be noted that the majority had either completed or entered an ongoing therapeutic programme at the end of the follow-up.

The results highlight elevated SMRs for males (no deaths among females), being higher for patients aged 35–44 years. Mortality rates were higher among older patients, Italian-born patients, individuals with a low school degree and those using alcohol and injecting any substance. Similar to other mortality studies on cocaine [19] and crack users [24], excess mortality was six times higher than in the general population, and overdose and infectious diseases (AIDS) were among the leading causes of death. Furthermore, we highlight a mortality excess for digestive system disease and malignant neoplasm of the liver. The prevalence of HIV, HCV and other infectious diseases is often higher among people who use crack cocaine relative to the general population [26, 27], driving AIDS-related mortality and probably contributing to excess mortality from liver disease [19].

It should be noted that in our study there were no deaths by homicide; this most probably reflects both the characteristics of Italian crack users, who turn to services for treatment, and the resulting changes in substance consumption and lifestyle.

This study presents some limitations that reduce the generalizability of the results and therefore further

research is required with specifically targeted studies. The number of people recruited and the person-years are quite low; also, the data used are those available from first admission, so data regarding average consumption variations or the use of other substances over time are lacking. Furthermore, it has not been possible to consider data concerning age at first use, because it was not collected uniformly.

Despite these limitations, several interesting aspects have emerged in identifying the vital statistics and mortality risks in a cohort of a population of patients treated for Crack use. In particular, it was possible to calculate the excess mortality compared to the general population adjusted for gender, age and calendar year.

The difficulties in carrying out studies in this field are well known [18]. Indeed, from the studies on crack use, significant problems and shortcomings regarding case definition, prevalence, morbidity and mortality have emerged.

CONCLUSION

The results of our study show that those who turned to a health service following problematic crack consumption have a high mortality excess compared to the general population, similar to that of problem cocaine users.

Furthermore, we observed a higher mortality risk among males, older patients, those with a low school degree, those using alcohol and those injecting any substance.

Rigorous epidemiological studies are needed to systematically assess health outcomes of crack-cocaine use and underlying pathways, also to inform evidence-based interventions.

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Table 1. Characteristics

		All cases (178) N (%)	Males (154) N (%)	Females (24) N (%)	P
Period of first admission	<=2010	54 (30.3)	49 (31.8)	5 (20.8)	0.487
	2011/2015	59 (33.2)	49 (31.8)	10 (41.7)	
	2016/2020	65 (36.5)	56 (36.4)	9 (37.5)	
Age at first admission	Mean (± standard dev.)	35.1±9.6	35.2±9.3	34.3±11.7	0.3357
Country of birth	Natives	130 (74.7)	107 (69.5)	23 (95.8)	0.007
	Non-natives	48 (27.6)	47 (30.5)	1 (4.2)	
Social situation	Homeless	26 (14.9)	26 (16.9)	-	0.029
	Any imprisonment	57 (32.0)	56 (36.4)	1 (4.2)	0.002
Professional condition	Regular income	33 (19.0)	31 (20.1)	2 (8.3)	0.384
	Unemployed	93 (53.4)	80 (51.9)	13 (54.2)	
	Student	3 (1.7)	3 (1.9)	-	
	Missing	49 (28.2)	40 (26.0)	9 (37.5)	
Educational degree	Primary/Secondary school	134 (77.0)	119 (77.3)	15 (62.5)	0.021
	High school diploma/University	33 (19.0)	4 (2.6)	9 (37.5)	
	Missing	11 (6.3)	11 (7.1)	-	
Marital status	Unmarried	127 (73.0)	110 (71.4)	17 (70.8)	0.916
	Married	17 (9.8)	15 (9.7)	2 (8.3)	
	Widow/separated/divorced	16 (9.2)	13 (8.4)	3 (12.5)	
	Missing	18 (10.3)	16 (10.4)	2 (8.3)	
Substances	Heroin	131 (75.3)	112 (72.7)	19 (79.2)	0.506
	Cocainie	96 (55.2)	83 (53.9)	13 (54.2)	0.980
	Alcohol	42 (24.1)	38 (24.7)	4 (16.7)	0.390
	Cannabis	29 (16.7)	25 (16.2)	4 (16.7)	0.957
	Benzodiazepines	11 (6.3)	11 (7.1)	-	0.176
	Any Injecting	76 (42.7)	64 (41.6)	12 (50.0)	0.437
	Injecting crack	40 (22.5)	36 (23.4)	4 (16.7)	0.464
Health situation	HIV positive	6 (3.4)	6 (3.9)	-	0.325
	HCV positive	37 (21.3)	33 (21.4)	4 (16.7)	0.593

Table 2 Crude Mortality Rates and Standardized Mortality Ratios*

		All cases (PY 1355)					Males (PY 1210)				
		O/E	CMR	95% CI	SMR	95% CI	O/E	CMR	95% CI	SMR	95% CI
Total		9/1.6	6.6	3.5-12.8	5.72	2.98-11.0	9/1.4	7.4	3.9-14.3	6.30	3.28-12.11
Age group	35-44 years	4/0.3	8.4	3.1-22.3	13.18	4.95-35.12	4/0.3	9.2	3.4-24.4	13.90	5.22-37.03
	>44 years	5/1.1	11.8	4.9-28.4	4.38	1.82-10.51	5/1.0	12.7	5.3-30.6	4.88	2.03-11.72
Infectious diseases		2/0.06	1.5	0.4-5.9	35.40	8.85-141.54	2/0.05	1.7	0.4-6.6	38.14	9.54-152.48
Viral hepatitis		1/0.01	0.7	0.1-5.2	91.20	12.85-647.47	1/0.01	0.8	0.1-5.9	94.02	13.24-667.43
AIDS		1/0.02	0.7	0.1-5.2	43.22	6.08-306.83	1/0.02	0.8	0.1-5.9	44.67	6.29-317.08
Malignant neoplasm of liver and intrahepatic bile ducts		1/0.04	0.7	0.1-5.2	24.24	3.42-172.10	1/0.04	0.8	0.1-5.9	25.43	3.58-180.51
Malignant neoplasm of oesophagus		1/0.01	0.7	0.1-5.2	91.29	12.86-648.10	1/0.01	0.8	0.1-5.9	95.94	13.51-681.05
All tumors		2/0.6	1.5	0.4-5.9	3.30	0.83-13.21	2/0.5	1.7	0.4-6.6	3.83	0.96-15.33
Digestive system		1/0.1	0.7	0.1-5.2	14.41	2.03-102.30	1/0.1	0.8	0.1-5.9	15.37	2.16-109.08
Gastritis and duodenitis		1/0	0.7	0.1-5.2	1334	188-9476	1/0	0.8	0.1-5.9	1499	211-10638
External causes		3/0.3	2.2	0.7-6.9	10.32	3.33-31.98	3/0.3	2.5	0.8-7.7	10.72	3.46-33.22
Overdose		2/0.02	1.5	0.4-5.9	114.18	28.56-456.54	2/0.02	1.7	0.4-6.6	118.05	29.52-472.03
Suicide		1/0.1	0.7	0.1-5.2	8.68	1.22-61.60	1/0.1	0.8	0.1-5.9	9.01	1.27-63.99

* Adjusted for age and calendar year (Standard: Emilia Romagna Region)
O, observed death; **E**, expected death; **CMR**, crude mortality rate per 1000 PY; **SMR**, standardized mortality ratios; **CI**, confidence interval