Cannabis use and violent behaviour:
a psychiatric patients cohort study in Southern Italy

Uso di cannabis e comportamento violento:
studio di coorte condotto tra pazienti psichiatrici nel Sud Italia

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SUMMARY. An ample volume of research evidence supports the conclusion that drug use/abuse is correlated with violent behaviour. Some studies have shown that co-morbidity also appears to be predictive of violent behaviour. The research evidence indicates gender differences, while socio-economic and familial factors play a role, too. **Method.** We conducted a retrospective study of the clinical files of four public psychiatric outpatient facilities during five years. The objectives of the research were to identify and analyze relationships between: a) cannabis use/abuse and violent behaviour and b) cannabis use/abuse, psychopathology, and violent behaviour. The study sample consisted of 1,582 subjects. The data, gathered in a dedicated database, were processed by applying univariate and multivariate analysis models. **Results.** Subjects who used/abused cannabis showed a high prevalence of violent behaviour. Regardless of the type of psychiatric disorder, the use of cannabis appears to be an evident risk factor. Significant correlations also emerged between cannabis use/abuse and the type of violent behaviour, especially self-inflicted injury. Evidence also emerged that other factors are implicated. This is consistent with the current literature proposing multi-causal explanations of violent behaviour.

KEY WORDS: substance abuse, mental illness, cannabis, violence.

RIASSUNTO. Molte indagini sostengono che l'uso/abuso di droghe sia correlato a comportamenti violenti. Alcuni studi hanno dimostrato anche che la comorbilità sembra essere predittiva di comportamenti violenti. I dati indicano differenze di genere e sottolineano il ruolo di fattori socio-economici e familiari. **Metodo**. Gli autori hanno condotto uno studio retrospettivo basato sull'analisi delle cartelle cliniche di quattro strutture pubbliche psichiatriche ambulatoriali, relative a un periodo di cinque anni, con l'obiettivo di identificare e analizzare le relazioni tra: a) l'uso/abuso di cannabis e comportamento violento e b) l'uso/abuso di cannabis, la psicopatologia e il comportamento violento. Il campione di studio è costituito da 1582 soggetti. I dati, raccolti in un database, sono stati elaborati applicando modelli di analisi univariata e multivariata. **Risultati.** Soggetti che avevano usato/abusato di cannabis hanno mostrato un'alta prevalenza di comportamenti violenti. Indipendentemente dal tipo di disturbo psichiatrico, l'uso della cannabis sembra essere un fattore di rischio evidente. Correlazioni significative sono emerse anche tra consumo/abuso di cannabis e il tipo di comportamento violento.

PAROLE CHIAVE: abuso di sostanze, malattia mentale, cannabis, violenza.

INTRODUCTION

Epidemiological studies have shown that substance use/abuse is predominantly a male disorder (70-80% of drug addicts are male) (1), although more recent surveys have shown an increasing prevalence among women, especially in younger age groups (2). This may be a result of the increased opportunities nowadays for both men and women to gain access to addictive substances (3).

Numerous studies have found significant relationships between drugs abuse and the likelihood of violence: research evidence indicates that alcohol abuse is more clearly established as a predictor and precipitant of violent behaviour in males than females (4). Instead, drug abuse, as distinct from alcohol abuse, has been found to predict subsequent violent behaviour in females as well as males (5-8). Alcohol and cocaine act through their direct and immediate pharmacological properties (9). In fact, Mcdonald et al. (10) reported a high percentage of alcohol and cocaine use/abuse during the 6 hours preceding the implementation of violent behaviour in a sample of young adults referred to various care services.

Indeed, in an earlier review Mcdonald et al. (8) had indicated that as many as 28.7% of people under sentence for inflicting intentional injury (primarily homicides) tested positive for cocaine. The consumption of cocaine and alcohol was also a constant in other types of injuries both intentional and non-intentional, fatal and non-fatal, taken into account in the studies on which his review was based. Some researchers have also reported gender-specific factors related to substance abuse: women alcoholics undergo a more rapid progression to liver cirrhosis (11) and appear to be more susceptible to alcohol-induced brain damage (12). Women may also have a greater subjective response to cocaine (13) and amphetamines (14) than men do, and appear to become more rapidly addicted to drugs such as cocaine and heroin (15). Women drug abusers show a comparable or greater severity of cocaine addiction (16), as well as a greater severity of medical problems and of psychiatric problems (17). According to some authors (18) this finding actually reflects the greater prevalence rates of primary mood and anxiety disorders experienced by women in general, while others (19) have suggested that the more frequent and more severe emotional distress and related disorders observed in women may contribute to a faster progression of substance dependence. The severity index is used as a detection tool in all scales except those involving legal issues related to drug consumption, and women show a worse score than men, even when including variables such as socio-economic levels (family breakup, loss of work) (3).

Unlike studies of other drugs, those on the relationship between violent behaviour and cannabis have provided controversial results (8,3,20). Cannabis use and criminal involvement seem to be strictly correlated (21). Cannabis use has been found to be highly correlated with violence among adolescents (21,22). Recent evidence (23-27) shows that the use of cannabis at an early age is a negative predictive factor both for the subject's social and relational life in adulthood and for their general health.

Moreover, it favors the escalation toward substance abuse and heroin and cocaine addiction (28), that are in turn correlated with criminal activities (29). Conduct problems and violent behaviour in childhood and adolescence are recognized risk indicators for future substance abuse or dependence (22,30). Despite the above evidence, the general public's perception of the dangers of cannabis has progressively declined in the USA in the last 30 years (31). Although the mechanisms underlying this correlation are not yet clear, it is assumed that substance abuse and violent behaviour reflect general syndromes featuring deviance or behavioural problems (23,32). To explain the above-reported correlations, Green et al. (33) recently hypothesized that three mechanisms are potentially responsible for the link between adolescent marijuana use and crime, namely school dropout, onset of drug disorders, and escalation of drug use to cocaine or heroin.

Other surveys have analyzed psychopathological factors. Anxiety and depression disorders in early childhood and adolescence may precede the development of substance use disorders (24,34), and are correlated with the development of violent behaviours (35). According to other authors (25,36), substance abuse – especially cannabis – precedes the implementation of violent behaviour, and they argue that cannabis use in childhood and adolescence is a factor that establishes a persistent pattern of violent and lawless behaviour from adolescence through to early adulthood. Cannabis is also widely available (26,37), especially among adolescents and young people up to the age of 20, and the peak onset of use is around 16-18 years (27,38). Among cannabis-dependent patients, women report fewer pretreatment years of regular cannabis use (this is also true for dependence on other drugs) (3).

In Macdonald's view (8), the role of cannabis use/abuse is controversial, unlike the data on cocaine, for example, whose role as a risk factor in violent behaviour is much clearer. Some authors (28,39) have not identified clear evidence of a correlation between cannabis use/abuse and violent behaviour. Macdonald reached the same conclusions in a more recent survey (10): «Frequency of cannabis use, however, was not significantly related to violence when controlling for other factors» but other variables are also associated with cannabis use/abuse, such as family and/or socio-economic levels, that contribute to the development of violent behaviour (40). Moreover, Green et al. (33) suggested the notion of the cumulative disadvantage (41), whereby heavy adolescent marijuana use reduces the likelihood of school completion, a key life domain

which can reduce future opportunities of successful social adaptation, such as employment, which in turn facilitates criminal behaviour. This is consistent with the current literature proposing multi-causal explanations for violent behaviour (42). Friedman (5) lists some of these explanations in his review: parental violent behaviour and substance abuse (particularly paternal), parental mental illness, previous criminal records. However, their role is still quite controversial.

In the present work we conducted a retrospective study of the clinical files of four public psychiatric outpatient facilities during the period of five years. The objectives of the research were to identify and analyze relationships between: a) cannabis use/abuse and violent behaviour and, in particular, b) cannabis use/abuse, psychopathology, and violent behaviour.

METHODS

The four different public psychiatric outpatient facilities taken into consideration met all analog criteria of homogeneity: social and economic context; number of citizens resident in the territory (40-60000); characteristics of the territory (medium-sized cities located within a 100-kilometre radius of Bari (the capital city of Apulia, a region in Southern Italy); type of professional figures present in each treatment team; methods of access to the facility; treatment methods utilized; care modalities. In addition, the local social service agencies in each municipality were included in the investigation. All patients treated continuously for six months in the period of our study were considered eligible for this study, whereas occasional patients were excluded.

A standardized questionnaire was employed. The questionnaire, containing 31 multiple choice questions, was organized in three sections. The first section probed personal and family data, and the quality of the relationships between the family and the affected relative, as well as information regarding other violent behaviour and substance abuse in the family. The second section included current state clinical data. The third section listed the data on violent behaviour.

The resulting data were stored in a dedicated database covering the various risk factors (sex, family educational level and type, family history, work and treatment type, compliance). Cannabis abuse and violent behaviour were the main focus in the sample. For fixed variables (age), the mean and standard deviation are expressed.

Univariate analysis was done to verify any associations using double input (2 x) contingency tables and applying the Chi square test (x2); values of <0.05 were considered significant. The odds ratio (OR) and 95% confidence intervals were calculated. Significant differences between the means were calculated on the fixed variables (Age) employing the ANOVA test and T test for independent samples: A value of $p<0.05$ was taken as statistically significant.

To control the independence of the correlations identified between the various risk factors for cannabis abuse and between cannabis abuse and violent behaviour, regardless of the psychiatric disease, sex and age, logistic regression models have been devised. In each of the models the odds ratio and 95% confidence intervals were calculated. Statistical analyses were done using STATA 10MP software for the Macintosh OS X platform.

RESULTS

The sample consisted of 1,582 patients (49% males and 51% females), mostly adults (average age: 45.6 years, SD: ±14.1; $p<0.001$). Patients generally had long clinical histories, lasting more than 10 years in 70% of the cases.

The level of education (not determined in 1.4% of cases) was quite low: 9.5% had had no formal education; 35.9% completed elementary school; 32.1% finished middle school; 18.5% graduated from high school; possession of a university degree was rare (2.6%) (**Table 1**).

Slightly less than half the sample were gainfully employed (44.9%) but mostly as manual laborers (36.6%). Very few were employed in an intellectual line of work (2.0%) or in business (0.3%).

The most common diagnoses (**Table 2**) were a mood disorder (41.2%), psychotic disorders (27.3%),

Table 1. Level of education

None	9.5%
Elementary school	35.9%
Middle school	32.1%
High school	18.5%
University Degree	2.6

Table 2. Psychiatric disorders

Mood disorder	41.2%
Psychotic disorder	27.3%
Anxiety spectrum disorder	17.6%
Mental retardation	4.3%
Personality disorders	2.9%
Dementia	1.9%
Substance abuse	3.9%
Others	0.9%

and anxiety spectrum disorders (17.6%). Less common diagnoses included mental retardation (4.3%), personality disorders (2.9%), and dementias (1.9%). A constellation of statistically irrelevant diagnoses accounted for the remaining 0.9%. Substance abuse disorders were less common, too (3.9%), but 11.4% of our sample had used drugs and were described as "current" drug users (80%) and "regular" (92.81%), mostly of only one substance (alcohol 77.9%, cannabis 11.0%), rarely more than one (17.1%). Cannabis was used by 24 subjects (1.5% of all the subjects that habitually used or abused substances), 18 exclusively whereas 6 combined cannabis with alcohol.

After the first contact with the facility, virtually all the patients were started on psychopharmacological treatment (84%), 13.8% embarked on psychotherapy (43). The compliance to treatment after the first contact was described by health officials as "good" in 31.7% of cases, "satisfactory" in 39.8%, "unsatisfactory" in 22.1% and "discontinuous" in 15%.

Violent behaviour

Violent behaviour emerged in the clinical histories of more than one third (36.3%) of the patients in our sample. Males were clearly predominant among patients exhibiting violent behaviour (65.74%). In the majority of cases, it was exclusively inflicted on others (76.7%): verbal violence and threats (53.6%); followed by maltreatment, assault and battery (39.8%); injuries by assault (14.5%), with blunt objects (2.9%); with firearms (0.7%), other weapons (0.7%); attempted murder (0.9%); and murder (0.7%) (**Table 3**).

Notably, among patients who carry out violent acts against other people, there is a significant tendency toward relapse (42.8% "recurring", 17.1% "frequent"), and in almost half of these (47.1%) there are signs of progression.

Self-inflicted violent behaviour (**Table 4**) mostly involves attempted suicide (70.9%) or suicide (7.5%), self-inflicted injury (23.9% of cases), and downright

Table 4. Self-inflicted violent behaviour	
Attempted suicide	70.9 %
Suicide	7.5 %
Self-inflicted injury	23.9 %
Downright mutilations	0.7 %

mutilations (only 0.7%). Self-inflicted injuries are, for the most part, single episodes (64.2%), more than half of which is unpredictable (extemporaneous=26.1%; immediate=27.6%), 34.3% of the cases are described as "progressive".

Violent behaviour inflicted either on themselves or others was present in 9.2% of the cases, of which 14.1% were exclusively self-inflicted. Violent behaviour against objects seemed to be of a sporadic nature (59.6%) and unpredictable ("immediate"=38.5%, "extemporaneous"=19.2%). A family history of violent behaviour was present in 3.6% of the subjects and of substance abuse in 2.1%. There was a significant correlation between violent behaviour and a positive family history for both substance abuse (OR=13.4, IC 95% 5.2-34.3, χ^2=48.2) and violent behaviour (OR=7.9, IC 95% 4.0-15.2, χ^2=50.3). In about half of these cases the affected subject was one of the parents.

Significant associations with cannabis use/abuse

Subjects who used or abused cannabis were younger on average (mean age=32.2 years; SD=±12.6) than those who did not (mean age=45.8 years; SD=±14.1; p<0.001).

Consumers of cannabis were four-fold more common among males (OR=4.1; 95% CI=1.5-10.9; p<0.05). A family history of violent behaviour is directly associated to cannabis use; subjects with a family history of violent behaviour have a four-fold greater likelihood of using cannabis (OR=4; 95% CI=1.2-13.7; p<0.05). The use of cannabis is directly associated to part-time or temporary employment: smoking cannabis is six-fold more common in subjects with precarious employment than in unemployed subjects or those with a long-term contract (OR=6.1; 95% CI=2.6-14; p<0.05). The use of cannabis is also associated to poor compliance to treatment: those who suspend therapy are almost three-fold more likely to smoke cannabis (OR=2.9; 95% CI=1.2-6.9; p<0.05) (**Table 5**).

Finally, psychotherapy is directly associated to the use of cannabis: subjects undergoing psychotherapy are three-fold more likely to use cannabis (OR=3.2; 95% CI=1.3-7.6; p<0.05).

Table 3. Violent behaviour inflicted on others	
Verbal violence/threats	53.6 %
Maltreatment/assault/battery	39.8 %
Injuries by assault	14.5 %
Injuries with blunt objects	2.9 %
Injuries with firearms	0.7 %
Other weapons	0.7 %

Table 5. Risk factors of Cannabis use/abuse. Univariate analysis

	OR	95% CI	p
Sex (Male)	4.1	1.5-10.9	<0.05
Family history of violent behavior	4	1.2-13.7	<0.05
Part-time or temporary employment	6.1	2.6-14	<0.05
Poor compliance to treatment	2.9	1.2-6.9	<0.05
Psychotherapy	3.2	1.3-7.6	<0.05

There was no significant association between cannabis use and any particular psychiatric disease. The following associations were confirmed after applying logistic regression models: age, part-time or occasional work and psychotherapeutic treatment. Ageing reduces the probability of cannabis use by 10 % per year (OR=0.9; 95% CI0.89-0.97; p<0.05). Part-time or occasional working ethics tripled the likelihood of cannabis use and psychotherapy treatment multiplied it by 2.6 times (OR=2.6; 95% CI 1.4-9.5; p<0.05).

Significant associations between cannabis use/abuse and violent behaviour

Use/abuse of drugs was present in only a minority (11.4%) of the general sample of 1,582 patients, but 79.55% of these subjects exhibited violent behaviour (OR=8.7 with 95% CI 5.8-12.9; χ^2=162.7 with p<0.05), especially inflicted against others (63.1%). Multiple-substance addicts accounted for 17.36% of subjects combining substance abuse and violent behaviour. Cannabis played a prominent role here: it is the drug most proportionately correlated to violent behaviour. The combination of a mental disorder and cannabis use/abuse was present in 3.9% of subjects with violent behaviour, versus only 0.2% of patients with non-violent behaviour (OR=19.2 with 95% CI 4.4-118.6; χ^2=30.9 with p<0.05).

The use/abuse of cannabis is associated to the presence of at least one violent hetero-lesions behavioural episode: the probability of such a result is about ten-fold (OR=10.2; 95% CI=3.8-27.5; p<0.05) (**Table 6**). This association is independent of the presence of a psychiatric disorder, sex and age, as indicated by multiple logistic regression models (OR=11.3; 95% CI=3.8-33.5; p<0.05) (**Table 7**). In particular, cannabis use is associated with:

– injuries by beatings, increased 5-fold (OR=5, 95% CI=1.6-15.1, p<0.05);

– maltreatment and beatings, increased nearly 3.5-fold (OR=3.4 with 95% CI=1.4-8.3, p<0.05);

– violence and verbal threats, increased nearly 3.5-fold (OR=3.5 with 95% CI=1.5-8.1, p<0.05) (**Table 6**).

These associations remain independently confirmed regardless of psychiatric disease, sex and age, as indicated by the logistic regression model for injuries: OR=3.6; 95% CI=1.1-12.2; p<0.05 and verbal violence/ beatings or threats: OR=3.5; 95% CI=1.4-8.7; p<0.05.

Moreover, cannabis use/abuse is associated with the presence of at least one type of violent self-inflicted injury: abuse of this drug increases the probability of violent self-inflicted injury more than 5-fold (OR=5.7; 95% CI=2.4-13.5; p<0.05) (**Table 6**). This association also remains confirmed regardless of psychiatric disorders, sex and age, as indicated by the logistic regression model (OR=5.1; 95% CI=2.1-12.9; p<0.05) (**Table 8**).

In particular, cannabis use/abuse is associated with:

– attempted suicide, the probability being increased by more than 17 times (OR=17.6; 95% CI=3.5-87.7; p<0.05);

– suicide, the probability being more than tripled (OR=3.2; 95% CI=1.2-9.6; p<0.05) (**Table 6**).

These associations remain independently confirmed regardless of psychiatric disease, sex and age, as indicated by the logistic regression model (attempted suicide: OR=21.7; 95% CI=3.2-143.9; p<0.05 - suicide: OR=3.4; 95% CI=1.1-10.9; p<0.05).

Cannabis use/abuse increases the likelihood of violent behaviour more than 5-fold: OR=4.7; 95% CI=2.1-10.7; p<0.05. This association remains independently confirmed regardless of psychiatric disorders, sex and age, as indicated by the logistic regression model (recurring violence: OR=3.7; 95% CI=1.5-9.4; p<0.05).

Moreover, habitual violent behaviour associated with cannabis use/abuse is of 'immediate' type, and therefore difficult to predict (abuse increases the risk more than 4-fold; OR=4.3; 95% CI=1.8-10.2; p<0.05). This association is also confirmed independently of psychiatric disease, as shown in the logistic regression

Table 6. Violent behavioural and cannabis use/abuse. Univariate analysis

		OR	95% CI	p
Violent hetero-lesions behavioural episode		10.2	3.8-27.5	<0.05
	Injuries by beatings	5	1.6-15.1	<0.05
	Maltreatment and beatings	3.4	1.4-8.3	<0.05
	Violence and verbal threats	3.5	1.5-8.1	<0.05
Violent self-inflicted injury		5.7	2.4-13.5	<0.05
	Attempted suicide	17.6	3.5-87.7	<0.05
	Suicide	3.2	1.2-9.6	

Table 7. Violent hetero-lesions behavioural episode. Multivariate analysis

Violent hetero-lesions behavioural episode	OR	Z	P>|z|	95%IC		
Age	1.0	0.00	0.998	1	-	1
Sex (Male)	2.3	6.43	0.000	1.8	-	3.0
Use/abuse of cannabis	11.3	4.38	0.000	3.8	-	33.5
Anxiety	0.3	-2.95	0.003	0.1	-	0.7
Dementia	11.7	4.94	0.000	4.4	-	31.1
Personality disorder	3.1	2.72	0.007	1.4	-	6.9
Substance abuse	4.9	4.22	0.000	2.3	-	10.2
Mood Disorder	1.2	0.60	0.546	0.7	-	2.1
Mental retardation	4.7	4.23	0.000	2.3	-	9.6
Psychotic Disorder	4.9	5.62	0.000	2.8	-	8.5

Table 8. At least one type of violent self-inflicted injury. Multivariate analysis

Violent self-inflicted injury	OR	Z	P>|z|	95%IC		
Age	0.1	-1.78	0.075	0.1	-	1
Sex (Male)	0.85	-0.85	0.397	0.6	-	1.2
Use/abuse of cannabis	5.1	3.50	0.000	2.1	-	12.9
Anxiety	0.2	-2.29	0.022	0.5	-	0.8
Dementia	2.1	1.02	0.307	0.5	-	9.3
Personality disorder	1.9	1.03	0.303	0.7	-	6.1
Substance abuse	1.1	0.11	0.913	0.3	-	3.8
Mood Disorder	1.5	1.11	0.267	0.7	-	3.3
Mental retardation	1.1	0.15	0.881	0.3	-	3.5
Psychotic Disorder	1.8	1.41	0.158	0.8	-	3.9

model (progressive behaviour: OR=39; 95% CI=1.2-7.3; p<0.05).

DISCUSSION

Generally speaking, a significant prevalence of violent behaviour emerged in our sample, especially among more seriously ill psychiatric patients (psychotic disorders). The combination of substance use/abuse with psychopathology appears more predictive of violent behaviour. Green (33) also demonstrated a significant correlation between early use of cannabis and criminal conduct in adult life, but only as regards damage to property and linked to the drugs world, but not assault and bodily harm. In our study, substance abuse is confirmed as a specific risk factor for violent behaviour. These results concerning substance use/abuse should be highlighted: 4 out of 5 subjects that use/abuse substances exhibit violent behaviour. Cannabis, particularly, is more proportionately correlated to violent behaviour than other drugs. Regardless of the type of psychiatric disorder, cannabis use/abuse is associated with violent behaviour inflicted on the self and others, and constitutes a specific risk factor. Moreover, in our sample violent behaviour was correlated only to cannabis use/abuse and had a tendency to recur, being 'immediate' and therefore difficult to predict. In our survey, too, cannabis users/abusers were young. Interestingly, in our sample, the use of this substance decreased with ageing, and hence also the risk of violent behaviour, unlike the general trend that emerged in our sample among people who use/abuse substances. In fact, comparison between the average duration of mental disease in the groups of patients with and without violent behaviour, showed values of

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18.3 and 15.2 years, respectively (median 17 and 14, mode 10 and 6). Such a difference is a significant finding on the total sample (Mann-Whitney test 45.1, $p<0.05$) but, after subdividing the sample into subgroups by type of psychiatric disorder, statistical significance is confirmed only in patients with a mood disorder and substance abuse. It can be said that a longer disease course increases the risk of violent behaviour, but only with the above diagnoses.

Apart from the results emerging from the present study, many of which are in agreement with the literature, some of the limits typical of a retrospective study must be taken into account, and in particular the partial nature of the medical documentation available. Moreover, episodes of violent behaviour of the patients in public health service care are not always reported in the clinical records, even if the Police force were called in (44). It seems likely, therefore, that the phenomenon is underestimated in the population sample study.

In conclusion, the identified risk factors for cannabis use/abuse and violent behaviour (male sex, a family history of violent behaviour, discontinuous treatment, poor compliance), remain confirmed after the application of logistic regression models, as well as age, temporary/occasional work and psychotherapeutic treatment. These variables draw attention to the importance of therapeutic (type and treatment compliance) and socio-economic factors. It is these, together with cannabis use/abuse, that contribute to increase the likelihood of violent behaviour, and should be targeted by appropriate interventions.

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