Changes in Drug Use Patterns During the COVID-19 Pandemic in Italy: Monitoring a Vulnerable Group by Hair Analysis

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Research Article

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Abstract

Background

From March 22 until May 18, 2020, a complete lockdown in Italy was ordered by the government as a drastic and unprecedented countermeasure against the COVID-19 pandemic. Social isolation measures affect some populations more than others, and people with mental and drug and/or alcohol disorders are more likely to be adversely affected by home confinement. The literature on substance use during the COVID-19 pandemic is still nascent, but past research on other large-scale disasters suggests a modification in drug use patterns. This study presents for the first time experimental laboratory data on the use of alcohol and drugs in a high-risk population during Italy's first wave of the COVID-19 pandemic.

Methods

Thirty subjects with substance use disorders were monitored for the use of traditional drugs and alcohol every 3 months before, during and after lockdown by the analysis of hair, a biological matrix that permits retrospective evaluations.

Results

There was a general decrease in the use of traditional drugs during the lockdown: the number of samples positive for heroin, cocaine, MDMA and cannabis fell considerably and then resumed to pre-lockdown levels when the period of confinement was over. Interestingly, the consumption of benzodiazepines and alcohol followed the opposite trend. The number of benzodiazepine-positive samples increased and remained high even at the end of the lockdown. Similarly, alcohol consumption underwent a significant increase during the period of confinement and remained high even after the lockdown restrictions were lifted.

Conclusions

Confinement measures produced significant changes in drug/alcohol use patterns with a shift towards the use of substances that are more easily accessible and used for the self-medication of stress, anxiety, irritability, depressive symptoms and insomnia. Furthermore, the combined use of alcohol and benzodiazepines can alleviate the negative effects of abstinence from drugs that are no longer easily available. It is concerning that the levels of alcohol and benzodiazepine consumption have remained high even after the lockdown. Mixing benzodiazepines and alcohol can result in a number of serious short-term and long-term effects, which inevitably place further pressure on drug addiction and health services during and after the pandemic.

Background

Coronavirus disease of 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in December 2019 in Wuhan, China and then declared as a public health emergency of international concern in January 2020 and as a pandemic in March 2020 [1]. The Italian government from 10 March 2020 has implemented various initiatives to prevent or delay the spread of COVID-19, such as the lockdown of social and cultural activities and the partial closure of economic and industrial activities [2, 3]. A second government decree, on March 22, 2020 imposed even stricter rules, such as the closure of all non-strategic economic activities, including schools, universities and shops selling non-essential goods [3, 4]. People were allowed to leave their homes for specific and documented reasons only [3]. Although these measures were necessary to reduce the pressure on Italian health system, there are reasons to be concerned because prolonged home confinement during an epidemic can reduce the level of physical activity and exposure to daylight and increase the level of stress due to social isolation [5, 6]. Indeed, quarantine effects have already been explored during past outbreaks, such as during the outbreaks of severe acute respiratory syndrome (SARS) in 2003 and Ebola in 2014, and studies have shown that the mental health impact can be broad, extensive and long lasting [7]. Among the consequences of quarantine are acute stress disorders, anxiety, irritability, poor concentration and indecisiveness, poor work performance, posttraumatic stress disorders, high psychological distress, depressive symptoms and insomnia [8]. In addition, economic consequences of the COVID-19 outbreak can be particularly dramatic for people in precarious employment or financial conditions, causing unparalleled distress among them due to the sheer uncertainty of their future [9]. Distressed people may seek refuge in inexpensive and readily available addictive substances to allay their negative feelings [10]. This can potentially trigger the development of substance use disorders (SUDs) in high-risk groups and a spike in the incidence of SUDs among the general population as well [11–13]. Persons who are isolated and stressed—as much of the population is during a pandemic—frequently turn to such substances to alleviate their negative feelings [14].

This begs the question of whether the significant increases in alcohol sales (including those by mail) when compared to the same period in the previous year that have been observed in many countries are due to the pandemic [15]. As an example, a March 2020 study conducted by the Nielsen Company in the USA found 240% increase in internet alcohol sales, including increase in the sales of strong liquor (spirit) by 75%, wine by 66%, and beer by 42% [16].

Although the literature concerning substance use in the context of COVID-19 is still nascent, past research from other large-scale disasters suggests that, in general, increases in substance use are observed following exposure to a disaster [17].

To the best of our knowledge, there are currently no studies that document with experimental data the risk of substance/alcohol abuse during the COVID-19 pandemic. This is the first study to investigate drug and alcohol misuse in 30 subjects with a history of substance and/or alcohol abuse who were monitored every 3 months during the first wave of the COVID pandemic in Italy (before the lockdown, immediately

after and 3 months after the end of the lockdown) by means of the analysis of hair, a matrix that provides valuable retrospective information [18].

Methods

Patients and Sample Collection

Laboratory procedures were conducted in accordance with the Helsinki Declaration of 1975 (revised 1983) and approved by the Bioethics Review Board of the University of Perugia (Protocol 2012-006R). All participants provided informed consent. The study material consisted of 3-cm hair samples collected from 30 patients (age 18–48 y; 17 males; 13 females) with drug and/or alcohol disorders, who were monitored for drug/alcohol consumption via hair analysis every three months.

Preparation and Analysis of Hair Samples

All hair samples were prepared, extracted, and derivatized by fully validated, previously described methods [18].

Opiates (codeine, 6-acetylmorphine, morphine), cocaine (and its metabolite benzoylecognine), cannabinoids (D9-tetrahydrocannabinol and its metabolite 11-nor-9-carboxy-D9-tetrahydrocannabinol), amphetamine, methamphetamine, MDMA, and benzodiazepines (BZDs: alprazolam, clonazepam, delorazepam, diazepam, flurazepam, lorazepam, midazolam, nitrazepam, oxazepam, temazepam, and triazolam) were analysed by gas chromatography-mass spectrometry (Focus gas chromatograph coupled with an ISQ; Thermo Electron Corp., Milan, Italy) in selective ion monitoring mode.

To measure alcohol intake in the hair samples, ethyl β-D-6-glucuronide (EtG) was chosen as a specific marker, and its extraction and analysis were carried out according to a fully validated method [19]. EtG chromatographic analysis was carried out using a 7890B Agilent gas chromatograph (Agilent Technologies, Santa Clara, CA 95051 United States) coupled to an Agilent 7000C triple quadruple mass spectrometer detector with an electron impact ion source. Data were acquired in multiple reaction monitoring mode. The method was fully validated and applied routinely in our laboratory.

Statistical Analysis

Descriptive statistics were performed using frequencies, percentages, frequency tables for categorical variables and the means ± standard deviations (SDs) for quantitative variables. One-way repeated-measures ANOVA was performed because measurements were taken for each participant at multiple time points. The Shapiro–Wilk W test was used to assess the normality of the distribution of the data.

Statistical analyses were performed using STATA 16.1 (Stata Statistical Software: Release 16. College Station, TX, USA).

Results

In the present study, 30 subjects with SUDs were monitored for alcohol and drug use quarterly during the first wave of the COVID-19 pandemic in Italy. Home confinement lasted from 22 March to 18 May 2020. Two toxicological control measurements were obtained in December 2019 and March 2020, corresponding to the phase before the lockdown. Furthermore one more toxicological control was obtained in June 2020 that includes the lockdown period and the last measurement, which concerned the post-lockdown quarter, was obtained in September 2020.

Hair was the selected modality of analysis, as it provided long-term information on drug use. Considering that the average hair growth is 1 cm per month, a hair sample that was 3 cm in length allowed us to examine a retrospective time window of approximately 3 months [20]. Moreover, hair sampling is simple, rapid, minimally invasive, and supports the identification and quantitation of multiple analyses per sample [20].

The results obtained by analysing hair samples show an overall significant reduction in the use of substances during the lockdown period (June 2020) compared to the pre-lockdown control periods (December 2019 and March 2020) (Fig. 1A). The number of sample positive for heroin decreased from 9 and 8 in the pre-lockdown period to 3 during lockdown and then returned to the initial level (10) when the restrictive measures were relaxed (Fig. 1B). A similar situation was observed with regard to the number of samples positive for cocaine, which was reduced by approximately 30% during the lockdown and then returned to pre-lockdown levels (12) in September 2020 (Fig. 1C). The number of samples positive for MDMA, which were initially limited to only 2, decreased to 0 during the lockdown and then increased to 4 after the restrictions were lifted (Fig. 1D). The number of samples positive for cannabis also decreased considerably from 8 and 7 in December 2019 and March 2020, respectively, to only one during home confinement and then increased in September to slightly higher levels (13) than before the lockdown (Fig. 1E). Interestingly, BZDs consumption followed an opposite pattern with respect to the traditionally abused drugs monitored here. In fact, the number of samples positive for BZDs ranged from 5 in the period before the lockdown to 16 during the lockdown and remained at high levels (13) even after the lockdown (Fig. 1F).

A pattern similar to that for BZDs was observed for alcohol consumption, which in the present study was monitored by measuring the variations in EtG, a useful biomarker for detecting alcohol abuse. EtG is a nonoxidative, non-volatile, stable, minor direct ethanol metabolite that forms in the liver as the result of ethanol and glucuronic acid conjugation and can be collected in several body fluids, tissues and hair [21]. Based on internationally adopted cut-off concentrations, abstinence from alcohol can be verified (EtG in hair < 7 pg/mg), and chronic excessive drinking with a consumption of 60 g or more ethanol per day can be detected (> 30 pg/mg). EtG concentrations between 7 and 30 pg/mg hair are regarded as a strong indicator of regular alcohol consumption [22, 23].

Interestingly, the EtG values detected here increased significantly from approximately 43 pg/mg in the pre-lockdown period to 59 pg/mg in the lockdown period, and the remained high (56 pg/mg) in the post-lockdown period, $F(3, 84) = 30.8$, $p < 0.005$ (Fig. 2).

Discussion

The experimental data presented here show an overall change in the pattern of drug use as a result of the unusual situation linked to the COVID pandemic. The strict limitations imposed on the movement and gatherings of people as a rapid response to the pandemic has greatly restricted social opportunities to use drugs [24]. The restrictions affected both the locations at which those who use drugs generally gathered and their ability to socialize. Pubs and clubs have been closed and festivals have been cancelled; the movements of people and social interactions have been severely limited by the implementation of quarantine and confinement measures [24]. These situations have commonly been cited as leading reasons for the decrease in the recreational use of illicit drugs, especially MDMA and cocaine, as demonstrated in this study, which are typically related to nightlife and party settings [24]. Unlike the findings for cocaine and MDMA, a less marked effect on cannabis use during the lockdown has been reported in some studies [24, 25]. The results from the present study show a significant decrease in cannabis use during the lockdown, although it tended to return to pre-lockdown levels in the post-lockdown period. Our data also show a reduction in heroin use during lockdown in the high-risk drug use population in Italy in the study. In some countries, it has been reported that opioid users have experienced a sharp decline in their primary sources of income (including panhandling and sex work) and a restriction in their ability to access drugs from their usual drug dealers [24]. This crisis has led some heroin users to access drug treatment services, while others have switched to using other more readily available substances, such as alcohol and BZDs [24]. Moreover, during this period of home confinement, drug users might no longer be looking for substances often consumed in social setting but rather for psychotropic drugs that are more often consumed alone [26]. The trends highlighted in this study show an increase in the consumption of BZDs, which has remained high even in the post-lockdown period. In some cases, the increased use of BZDs was associated with an increased use of alcohol both during and after lockdown. Changes in patterns of alcohol use have been fairly commonly reported in the EMCDDA Trendspotter briefings [24], including drinking more frequently, consuming greater quantities of alcohol and drinking alone. Interestingly, the consumption of all the substances analysed (heroin, cocaine, MDMA and cannabis) at the end of the lockdown returned to levels similar to those prior to the lockdown, except for alcohol and BZDs, which have remained at the higher levels reached during the lockdown. Although patients in the study had fairly high baseline EtG values, the highly significant increase in alcohol consumption observed during and after the lockdown can be attributed to the effects of the pandemic, as highlighted by other authors [27–29]. Periods of isolation and loneliness can have long-lasting negative consequences on individuals' physical and mental well-being. The feeling of isolation can cause anxiety, anger, sleep disorders, depression, and posttraumatic stress disorders, which can lead to an increase in the consumption of self-care substances such as alcohol and BZDs, both of which are central nervous system depressants that can result in a range of adverse health effects [26, 30, 31]. Overall, the COVID-19 pandemic could lead to a spike in alcohol abuse, relapses and potentially the development of alcohol use disorders combined with the concomitant abuse of other drugs in at-risk individuals, thereby placing further pressure on drug and alcohol addiction services and health care services in general during the post-pandemic period [15, 27, 32].

Conclusion

The health and social consequences of the COVID-19 pandemic are not yet clearly known. Lockdown policies aim at limiting the pandemic may have affected substance use. The study described here monitored 30 patients with SUDs before, during and immediately after the lockdown in Italy following the first wave of COVID-19 and showed clear changes in substance use patterns. In particular, there was an increased tendency to replace traditional drugs with other potentially dangerous but more easily available substances, such as alcohol and BZDs. This increase in the use of alcohol and BZDs has continued after the lockdown, while the use of traditional drugs has returned to pre-lockdown levels, leading to an elevated risk of developing comorbid psychiatric disorders and other health conditions [30]. Therefore, it is important that governments provide the public with warnings about excessive alcohol consumption during isolation to protect vulnerable individuals [32]. This study was limited to a population at high risk for alcohol and drug use and monitored a small number of subjects. Therefore, continued monitoring of these patients during the second wave of the COVID-19 pandemic in Italy is proposed to obtain data that can be used to determine whether the observed changes in drug use patterns are stable. It would also be useful to combine experimental data about the consumption of drugs and alcohol in the general population with other reports from forensic toxicology laboratories on data collected during the COVID-19 pandemic.

Abbreviations

COVID-19
coronavirus disease of 2019
SARS-CoV-2
severe acute respiratory syndrome coronavirus 2
SARS
severe acute respiratory syndrome
SUD
substance use disorders
BZDs
benzodiazepines
EtG
ethyl β-D-6-glucuronide

Declarations

Ethics approval and consent to participate

Laboratory procedures were conducted in accordance with the Helsinki Declaration of 1975 (revised 1983) and approved by the Bioethics Review Board of the University of Perugia (Protocol 2012-006R). All participants provided informed consent.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

Not applicable

Funding

Not applicable

Authors' contributions

AG analysed the data, MB verified the analytical methods, AK and NA carried out laboratory analysis, AG and IM carried out hair sample collection, and CG wrote the manuscript with input from all authors. All authors read and approved the final manuscript.

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Not applicable

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Figures

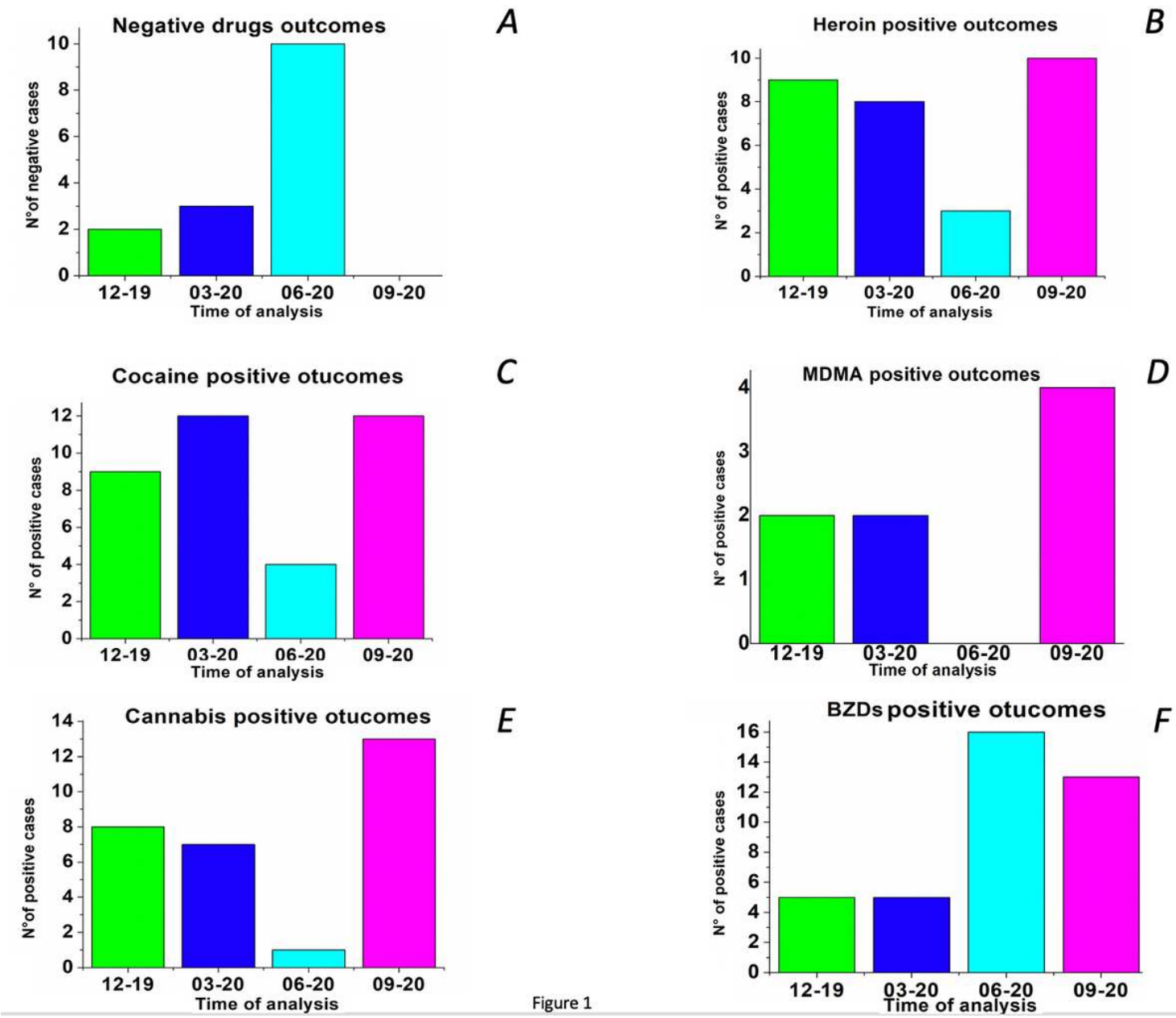

Figure 1

Figure 1

Number of samples negative for any drug (A), number of samples positive for heroin (B), cocaine (C), MDMA (D), cannabis (E) and BZDs (F) according to analysis before (12-2019 and 03-2020), during (06-2020) and after (09-2020) Italy's first wave of the COVID-19 pandemic.

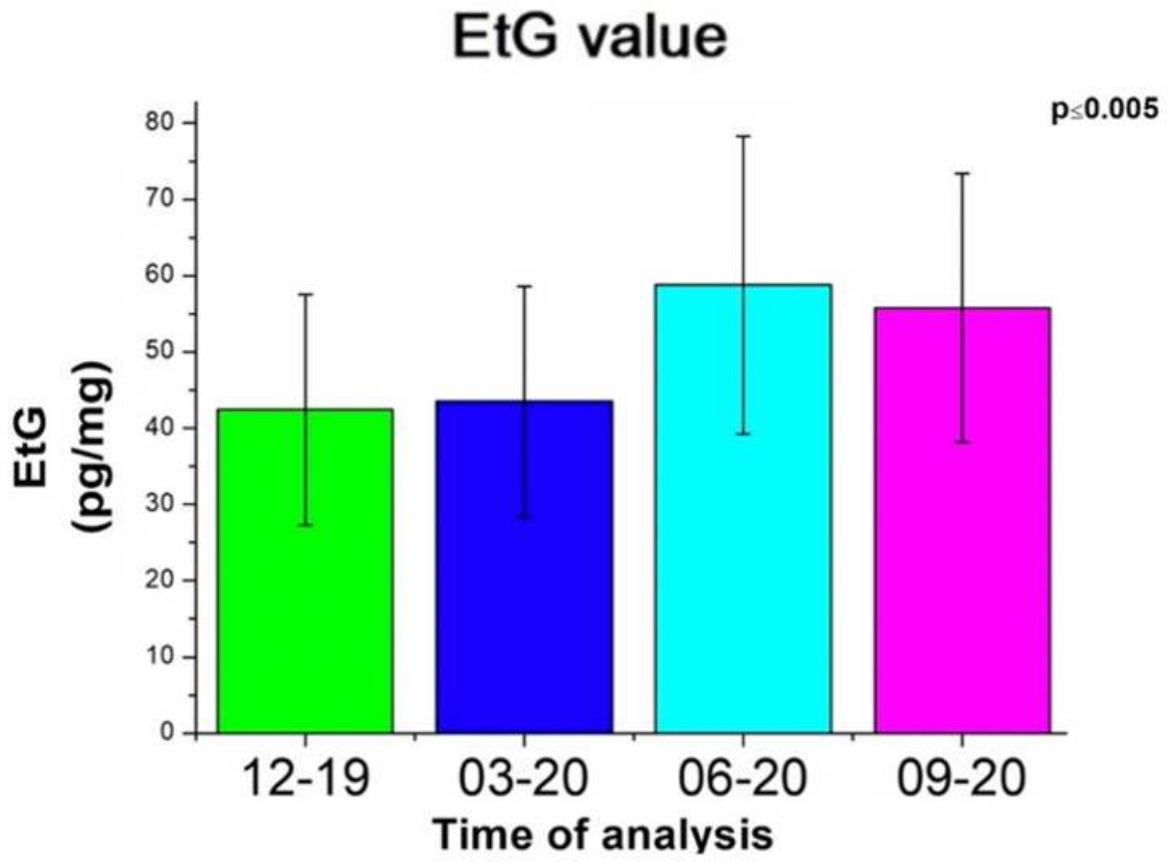

Figure 2

Mean EtG values measured in hair before (12-2019 and 03-2020), during (06-2020) and after (09-2020) Italy's first wave of the COVID-19 pandemic.