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Systematic Review

Trends in Substance Use and Abuse During COVID-19 Among the General Population

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Abstract

Background: COVID-19 pandemic has brought many public health issues, including substance use and abuse. Individuals abusing substances are vulnerable to severe infections caused by SARS-CoV-2 virus as well as impairment of the immune system, mental health, and physical health. Despite considerable efforts to minimize and prevent substance use, the use of tobacco, alcohol, and illicit substances is ever increasing resulting in morbidity and mortality which significantly leads to socio-economic costs.

Methods: A quantitative review of the literature searched in PubMed and Google Scholar databases yielded a total of 1416 studies among which 27 cross-sectional studies, conducted on the general population of 15 and above years of age, were selected based on the eligibility criteria.

Findings: A sample of 1,021,118 individuals were investigated in this study. The most commonly used substances were marijuana (100%), methadone (69.86%), and large cigar (60%). A total of 26 substances were reported to have been used during pandemic, 13 of which showed trends in usage (increased/decreased/no change). Of the total sample, 45.89% were males, 54.14% females, and 1.28% others.

Conclusion: Everyone and anyone is susceptible to alcohol, tobacco, and other substance use and abuse at different stages of their lives. Therefore, the need for effective preventive strategies is critical in community efforts to combat substance abuse. Combined efforts from local and global stakeholders will lead to curbing the issue of substance use and abuse worldwide.

Keywords: Substance abuse, Substance use, COVID-19 disease

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Introduction

The COVID-19 pandemic was an unfortunate situation and globally people faced tremendous challenges especially in health care and broader social structure perspectives. The impact of the pandemic on addiction, mental health, and health behavior is proven and still ongoing with a larger burden of consequences by putting individuals at a greater risk for drug abuse as well as drug dependence. The vulnerable population such as those who consume alcohol, cigarette, opioids, and cannabis, and even those with substance use disorders (SUDs) pose a direct challenge to their respiratory, neurological, and immune system making them susceptible to the COVID-19 virus and increasing the severity of infection when and if exposed to the virus. The response to infection diminishes with age but people who are young and with vaping habits per se (vaping nicotine, tetrahydrocannabinol, or even just flavorings) develop a characteristic lesion in their lungs, called "popcorn lung", which has been confirmed by various clinical studies. Such habits induce lung injury, damage lung tissues, cause inflammation, and reduce the lung's capacity and ability to respond to the COVID-19 virus.[1]

The terms substance use and abuse are often used interchangeably when discussing alcohol and drugs. It is essential to understand what these terms mean. Substance use is defined as any consumption of drugs like alcohol,[2] and sometimes the consumption of illegal substances like anabolic steroids, heroin, marijuana, inhalants, cocaine, and methamphetamines.[3] However, substance abuse refers to the continuous use of drugs even when it causes health problems and troubles with work, family, and daily activities. Chronic drug abuse issues are less devastating than addiction but long-term abuse of substances will eventually damage the user's life. Drug abuse can lead to the following problems in the user within a year: (1) legal problems, (2) harming others around, (3) inability to perform necessary activities at home and workplace or manage responsibilities, (4) on-going use of the substance despite previous problems related to poverty, war, etc.[4]

As put forward by the World Drug Report 2019, improvements in research and data collection have

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revealed that more than 35 million people are estimated to suffer from drug use disorders, which has increased to 56% from the previous year, and opioid as a substance has been responsible for two-thirds of the 585 000 deaths caused by substance use in 2017. Based on the same report, it was observed that opioid users have increased by 56% compared to previous evaluations. A 2017 report showed around 271 million people i.e., 5.5% of the world's population, used substances in the previous year and this was similar to a 2016 estimate.[5] Despite considerable efforts to minimize and prevent substance use, the use of tobacco, alcohol, and illicit substances is ever increasing resulting in morbidity and mortality which significantly leads to socio-economic costs. In a country like America, 1 in every 5 deaths is attributed to cigarette smoking i.e., more than 400 000 deaths.[6] Substance use by teenagers can have a huge impact on their overall health and well-being. Accordingly, the American Academy of Pediatricians with the cooperation of the Centers for Disease Control and Prevention (CDC) developed a guide to help pediatric practitioners implement substance use screening so as to address the substance use concerns. The guide highlighted that alcohol, marijuana, and tobacco are the most commonly used substances by adolescents. Moreover, from among 12th graders, every other student reported using medicines without prescription, and from among from 9th-12th graders, around 4 of 10 students reported having tried a cigarette.[7]

From the continental perspective, as per WHO's regional data, cannabis is the most widely used illicit substance in the African continent. The rate of cannabis use in West and Central Africa was 5.2 % and 13.5%, respectively, indicating a high prevalence and swelling trend. Substances such as ecstasy (amphetamine-type stimulants or ATS) and methamphetamine are reported to be the second most extensively used drug type. Among youth and children surveyed in Sierra Leone, use of benzodiazepine, chlorpromazine, and different inhalants was reported, while 3.7% were reportedly using injectable drugs.[8] In North and South America, alcohol is reported to be responsible for 5.5% of all deaths and 6.7% of disability adjusted life years. Besides, 55% of the total population are current drinkers, 29% are life abstainers, and 17% are former drinkers. Out of the total current drinkers, 40.5% are known to be heavy episodic drinkers.[9]

Concerning the Asian continent, the main illicit drugs commonly abused in China are heroin, amphetamine, METH (methamphetamine), and MDMA (3,4-methylenedioxymethamphetamine), in Hong Kong are heroin, ketamine, and METH, in Taiwan are heroin, METH, ketamine, and MDMA, in Japan is METH, in South Korea is ATS, in Indonesia are ATS, heroin, and cannabis, in the Philippines are ATS and cannabis, and in Thailand are ATS and cannabis.[10] In India, alcohol is the most commonly used substance followed by opioids used by 2.1% of the country's population, heroin by 1.14%, pharmaceutical opioids by 0.96%, and opium used by 0.95% of the population, revealing that prevalence of opioid is three times the global average.[11] The first-of-its-kind National Household Drug Use Survey in India showed that 21.4% of individuals used alcohol apart from tobacco, followed by 3% using cannabis and 0.7% opioids. Based on observations, there was a stark variation in the states in terms of alcohol use, i.e., 7% in the Western state of Gujarat to a whopping 75% in Arunachal Pradesh. Moreover, tobacco use prevalence was 55.8% in males, with the maximum being used in the age group of 41-50 years.[12] According to National Family Health Survey (NFHS-4), in 15-49 age group, 45% of men and 7% of women consume some form of tobacco, the most common among men being chewing paan masala or Gutka (15%), followed by smoking cigarettes (14%) and bidis (13%). The most common form of tobacco used by women was chewing paan masala and Gutka or chewing paan with tobacco (2% each).[13]

Among older adults, health often gets affected by age-related changes and many health conditions require medications, sometimes in high dosage, which fall under class of addictive substances like use of opioid for management of pain. The presence of constant and persistent pain is another contribution to old-age health, especially with individuals suffering from cancer, or heart problems who have been prescribed opioids for pain relief. The CDC 2017 report for Nicotine use and abuse by the older age population revealed about 8 in every 100 adults, aged 65 and above, smoked cigarettes and alcohol was the most abused drug revealing high-risk drinking pattern. Statistically, 65% of the population was exceeding guidelines of daily alcohol consumption.[14]

There is a complex relationship between personal and community variables that are factored in as a contribution to substance use and abuse. Environmental factors and delayed behavioral, emotional, or cognitive regulation development may influence genetic vulnerabilities and help explain a correlation between childhood mental disorders and substance use and abuse issues in adolescents. Other factors contributing to the issue may include poor parenting skills, substance use by parents, and childhood mistreatment. From a pathophysiological perspective, a chief factor in substance use leading to addiction/abuse is neurophysiologic reinforcement. The presence of dopaminergic neurons which act as a reward pathway leads to increased levels of dopamine, serotonin, and norepinephrine and adolescents at this phase of brain development are at greater risk of neuropathology caused by substance abuse.[15]

Significant developmental changes occur in adolescence and even modest substance use can result in harm. An increased risk of injury and violence is associated with the behavior of drinking and drug use among

teenagers. A teenager diagnosed with SUD, compared with a non-SUD teenager, shows potentially chronic health problems. Substance use is not a direct cause for ideation towards suicidal behavior and thoughts per se but is indeed a significant risk factor. Increased risk for cardiovascular problems and heart disease has directly been linked to several substances like alcohol, tobacco, heroin, stimulants, and methamphetamine. Cocaine, on the other hand, as a stimulant, immediately impacts blood pressure which ultimately increases the chances of heart attack and cardiac arrest.[16] On the same lines, substance use and abuse potentially increase the risk of infectious diseases as well. Injection drug users (IDUs) are known to be at the greatest risk of getting infected with hepatitis C virus (HCV) in the United States and estimates suggest that numerous studies have found a prevalence of 70-90% among long-term IUD users and more than 60% in new HCV cases associated with IUD.[17]

Substance abuse, as a major public health concern, has affected all domains of the societies. Individuals, families, governments, and communities' overall spending are impacted by the use of both licit and illicit substances leading to a loss in wages, reduced productivity, increased criminal activity, loss of lives through suicide, and rise in health care expenses. Prevention can be achieved through designing an activity that aims to avoid substance abuse and lessen its social consequences like limiting illegal drug supply, educating to prevent long-term use of prescription medication, making youth aware of harmful consequences of substance abuse, and initiating activities aimed at treatment dependence, relapse prevention, and social reintegration.[18] Apart from the economic burden, public health can benefit from a better understanding of the trends of substance use and abuse, especially in the time of the COVID-19 pandemic which has come out to be a syndemic. Accordingly, this study focused on an understanding of the type of substances used and abused habitually and the reasons behind them to bring forward how the issue of substance use and abuse has emerged as a risk at the time of COVID-19 throughout different stages of life.

Methods

Search strategy

A comprehensive search was conducted on the quantitative literature published from December 2019 onwards, since the COVID-19 outbreak, in the electronic databases of PubMed and Google Scholar. All cross-sectional and longitudinal studies that contained information on trends of substance use and abuse among those aged above 15 years during the COVID-19 pandemic were retrieved. The terms used for searching were (Substance Use and Abuse) AND (Drug Use) AND (Pandemic or COVID-19 OR Coronavirus 2019 OR SARS Cov-2) AND (Younger Adults OR Older Adults OR 15 and Above years).

Study selection

Only those studies which reported data on various types of substances and substance use trends among individuals aged 15 years and above were included. An initial database search yielded a total of 1416 studies and finally, 27 studies were selected based on the eligibility criteria.

Preferred Reporting Items for the Systematic Review and Meta-analysis (PRISMA) was incorporated as a guidance tool to review the results. The studies which did not meet the inclusion criteria, irrelevant studies, and duplicated studies were thoroughly screened and removed (Figure 1).

Eligibility criteria

The inclusion criteria were studies conducted on individuals aged 15 years and above in the general population, having reported different substances used and abused during the COVID-19 pandemic, and being of a cross-sectional or longitudinal design. The exclusion criteria were studies done on the individuals below 15 years of age, studies on COVID-positive patients, review-based and closed access studies, non-English studies, and duplicated studies.

Results

A sample of 1 021 118 individuals were reviewed systematically of whom 45.89% (50 417/109 852) were males, 54.14% (59 474/109 852) were females, and 1.28% (226/17 541) others. Accordingly, 15 503 people included in the study were from North America, 45 161 from South America, 3507 from Oceania, 507 from Africa, 3016 from Asia, and 49 581 from Europe. Regarding different types of substances used, a total of 26 substances were reported to have been used in the COVID-19 pandemic. Sociodemographic characteristics were recorded which included age, sex, marital status, occupational status, education, locality of individuals, and key study findings (Table 1). The percentage of individuals who attempted to quit cigarettes and those who were successful in quitting cigarettes during the COVID-19 pandemic along with the percentage of trends in substances used and abused were also calculated. Based on educational status, a total of 30.71% (35 109) had a high school diploma, 1.10% (12 582) had a bachelor's degree, and 12.77% (804) had a master's degree.

Based on the percentage calculated for different types of substances used, it is observed that the most commonly used substances are marijuana (100%), methadone (69.86%), and large cigars (60%), and the least commonly used substances reported are amphetamine (3.61%), opioids (8.75%), and waterpipe tobacco (13.10%). All studies in the systematic review as well as the data regarding different types of substances used during COVID-19 are systematically represented with individual

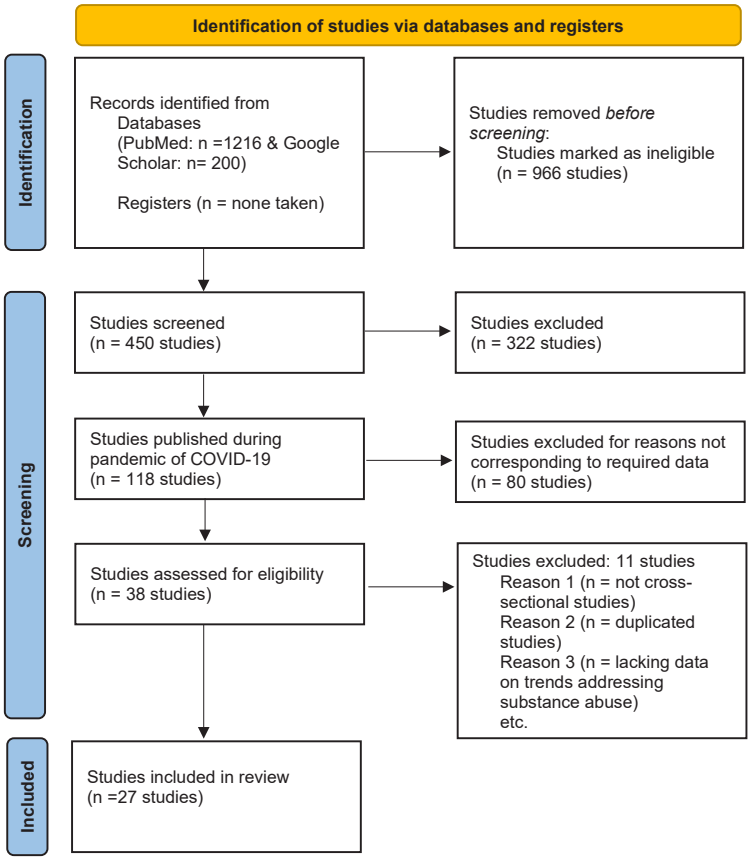

Figure 1. Summary of literature search and selection process

sample size (n) and percentage (%) (Figure 2).

Figures 3, 4, and 5, i.e., the graphs showing percentages of marital status, occupational status, and locality of individuals do not convey any new information but are paramount to keep in mind while analyzing, as they provide data on the sociodemographic characteristics of the study population.

The following table describes the changes in the substances used and abused during the COVID-19 outbreak in various continents, by the general population aged 15 years and above. A total of 13 substances were identified, wherein percentages were calculated by putting them into 3 categories (increased, decreased, no change). Based on the studies included for systematic review, the data on trends (increased, decreased, no change) of substances already mentioned were taken down and systematically analyzed, and "n" and "percentage" were calculated separately for each given substance (Table 2).

Moreover, based on the results of this study, 48.08% of individuals reported not attempting to quit cigarettes and 95.17% were not successful in quitting cigarettes during the COVID-19 pandemic.

Discussion

In times of crisis, especially in the context of an infectious disease outbreak such as the COVID-19 pandemic, there is usually a rapid implementation of measures for public health safety and disease prevention like social isolation, complete lockdown, physical distancing, lockdown of schools, workplaces, theatres, etc. Adapting to such a situation is not easy and it can have a great impact on their psychological and emotional well-being, which might contribute to the use and abuse of substances to cope with the crisis. Compared to other studies, the present study showed that marijuana (100%) was the most commonly used substance, followed by methadone (69.86%), and large cigars (60%). This is inconsistent with the results of a study by Elling et al[33] wherein the most commonly used substance was cigarettes (100%). In another study by Stanton et al,[22] alcohol was reported as the most commonly used substance. In the present study, the use of marijuana could mostly be attributed to the reason that coping with something that has never been experienced earlier can be very challenging and COVID-19 has upended lives in many ways, hence cigarettes, alcohol, and especially marijuana were used to cope with challenging events. Medical marijuana has been shown to address stress as it contains cannabinoids that bind to the ECS receptors which help in relieving symptoms of stress to a great extent.[46] Cannabidiol, often known as CBD or THC (tetrahydrocannabinol), is commonly known to alleviate anxiety-related symptoms. Experimental studies have shown that high dose of CBD may decrease anxiety and elevate mental sedation in

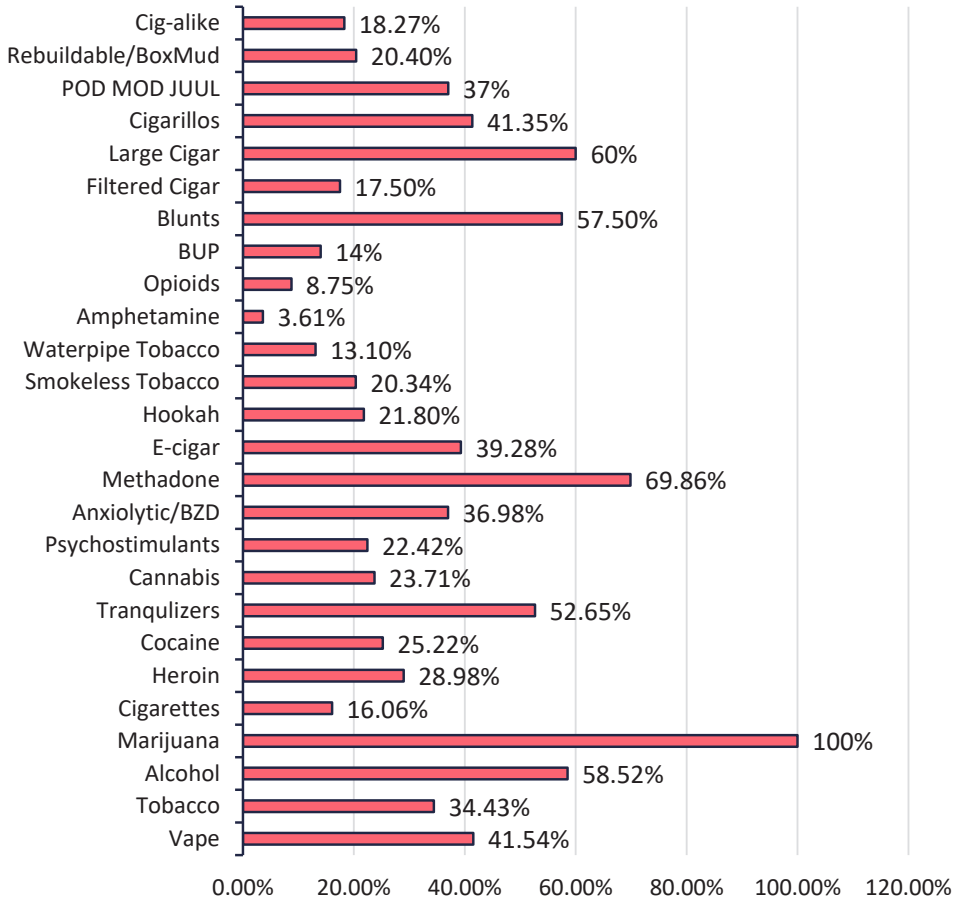

Figure 2. Different types of substances used by those aged 15 years and above during COVID-19 pandemic

Table 1. Population characteristics and study findings

First author	Study design and year	Region and continent	Sample size	Population characteristics	Result
Sharma[19]	Cross-sectional (2020)	Mid-Western Region North America	542	Age: 18-25 years Gender: Male:19.5% (n=106) Female:80.4% (n=436) Education level: High school: 43.17% (n=139) Bachelor's degree: 25.7% (n=234) Master's degree: 30.1% (n=168) Study population: General population	Substances used Vape: 100% (n=542) Tobacco:100% (n=542) Alcohol:100% (n=542) Marijuana:100% (n=542) Trends during COVID-19 Vape: Increased: 9.6% (n=52), Decreased: 15.1%(n=82) Tobacco: Increased: 8.3% (n=45), Decreased: 16.2% (n=88) Alcohol: Increased: 23.6%(n=128), Decreased: 7.9%(n=43) Marijuana: Increased: 13.4% (n=73), Decreased:12.3% (n=67)
Gendall[20]	Cross-sectional (2020)	New Zealand Oceania	332	Age: 18-90 years Gender: Male: 52.40% (n=174) Female: 47.5% (158) Education level: High school:51.20% (n=170) Bachelor's degree: 23.40% (n=78) Master's degree: 25.30% (n=84) Study population: General population	Substance Used Cigarettes:100% (n=332) Trends during COVID-19 Cigarettes (Tobacco): Increased: 42.46% (n=141), Decreased: 21.08% (n=70), No change: 37.04% (n=123)
Welle-Strand[21]	Cross-sectional (2020)	Norway Europe	226	Age: 18 and above Gender: Male: 73% (n=164) Female: 27.43% (n=62) Study population: General population	Substances used Alcohol: 33.20% (n=75) Heroin: 35.80% (n=81) Cocaine: 25.20% (n=57) Tranquilizers: 52.60% (n=119)

Table 1. Continued

First author	Study design and year	Region and continent	Sample size	Population characteristics	Result
Stanton[22]	Cross-sectional (2020)	Australia Oceania	1491	Age: 18 and above Gender: Male: 32.60% (n=484) Female: 67% (999) Others: 0.53% (n=8) Marital status: Married: 62.80% (n=918) Unmarried: 20.50% (n=300) Separated: 16.60% (n=243) Study population: General population	Substances used Tobacco: 11.50% (n=172) Alcohol: 100% (n=1491) Trends during COVID-19 Tobacco: Increased: 6.90% (n=103), Decreased: 3.40% (n=50), No change: 89.70% (n=1338) Alcohol: Increased: 26.60% (n=396), Decreased: 18.10% (n=270), No change: 55.30% (n=825)
Sidor[23]	Cross-sectional (2020)	Poland Europe	1097	Age: 18-25 years Gender: Male: 4.90% (n=54) Female: 95.10% (n=1043) Education level: High school: 46.39% (n=509) Bachelor's degree: 51.70% (n=567) Occupational status: Unemployed: 10% (n=110) Employed: 48.20% (n=469) Student: 47.20% (n=518) Location: Urban: 80.30% (n=881) Rural: 19.70% (n=216) Study population: General population	Substances used Tobacco: 14.10% (n=155) Alcohol: 1.30% (n=14) Trends during COVID-19 Tobacco: Increased: 45.20% (n=469), No change: 40% (n=439) Alcohol: Increased: 14.60% (n=160), No change: 77% (n=844)
Chappuy[24]	Cross-sectional (2020)	France Europe	219	Age: 22-70 years Gender: Male: 78.40% (n=171) Female: 21.60% (n=41) Others: 3.19% (n=7) Occupational status: Unemployed: 37.90% (n=74) Employed: 55.25% (n=121) Study population: General population	Substances used Tobacco: 85.10% (n=183) Alcohol: 56.10% (n=120) Heroin: 22.50% (n=48) Cannabis: 45.60% (n=98) Psychostimulants: 32.20% (n=69) Anxiolytic/BZD: 37.50% (n=81) Methadone: 71.50% (n=153) BUP: 14% (n=30) Trends during COVID-19 Tobacco: Increased: 27.30% (n=50), Decreased: 14.80% (n=27), No change: 57.90% (n=106) Alcohol: Increased: 29.20% (n=35), Decreased: 20.80% (n=25), No change: 50% (n=60) Cannabis: Increased: 27.60% (n=27), Decreased: 17.30% (n=17), No change: 55.10% (n=54) Psychostimulants: Increased: 36.20% (n=25), Decreased: 16% (n=11), No change: 47.80% (n=33) Heroin: Increased: 39.60% (n=19), Decreased: 18.70% (n=9), No change: 41.70% (n=20) Anxiolytic/BZD: Increased: 25.90% (n=21), Decreased: 6.20% (n=5), No change: 67.90% (n=55) Methadone: Increased: 14.40% (n=22), Decreased: 10.40% (n=16), No change: 75.20% (n=115) BUP: Increased: 23.30% (n=7), Decreased: 6.70% (n=2), No change: 70% (n=21)
Matsungo[25]	Cross-sectional (2020)	Zimbabwe Africa	507	Age: 18 and above Gender: Male: 37.08% (n=188) Female: 63% (n=319) Education level: High school: 7.72% (n=39) Bachelor's degree: 81.10% (n=410) Occupational status: Unemployed: 8.20% (n=7) Employed: 75.70% (n=383) Student: 5.71% (n=29) Location: Urban: 64.69% (n=328) Rural: 23.86% (n=121) Study population: General population	Substances used: Tobacco: 100% (n=507) Alcohol 100% (n=507) Trends during COVID-19 Tobacco: Increased: 45.90% (n=233) Alcohol: Increased: 46.70% (n=237)

Table 1. Continued

First author	Study design and year	Region and continent	Sample size	Population characteristics	Result
Chen-Sankey[26]	Cross-sectional (2020)	Washington D.C. North America	40	Age: 21-29 years Gender: Male: 42.50% (n=17) Female: 57.50% (n=23) Education level: High school: 17.50% (n=7) Bachelor's degree: 60% (n=24) Master's degree: 22.50% (n=9) Occupational status: Unemployed: 27.50% (n=11) Student: 65% (n=26) Study population: General population	Substances used: Cigarettes: 57.50% (n=23) E-cigar: 65% (n=26) Hookah: 67.50% (n=27) Blunts: 57.50% (n=23) Filtered Cigar: 17.50% (n=7) Large Cigar: 60% (n=24) Cigarillos: 90% (n=36)
Soule[27]	Cross-sectional (2020)	United States North America	93	Age: 18 and above Gender: Male: 44% (n=41) Female: 54.80% (n=51) Others: 1.07% (n=1) Study population: General population	Substances used Cigarettes: 53.80% (n=50) E-cigar: 2.10% (n=2) Hookah: 2.10% (n=2) Smokeless tobacco: 7.50% (n=7) Waterpipe tobacco: 11.80% (n=11) Cigarillos: 20.40% (n=19) POD MOD JUUL: 36.55% (n=34) Rebuildable/ Mech Mod/Box Mud: 20.40% (n=19) Cig-alike: 18.27% (n=17)
Chertok[28]	Cross-sectional (2020)	Ohio North America	810	Age: 18 and above Gender: Male: 27.50% (n=223) Female: 72.50% (n=587) Education level: High school: 50.40% (n=408) Bachelor's degree: 27.50% (n=223) Master's degree: 22.10% (n=179) Marital status: Married: 54.10% (n=438) Unmarried: 45.90% (n=372) Study population: General population	Substances used: Cigarettes: 22.59% (n=183) Trends during COVID-19 Cigarettes: Increased: 4.07% (n=33), Decreased: 8.51% (n=69), No change: 9.62% (n=78) Attempted to quit cigarette: Yes: 8.14% (n=66), No: 14.07% (n=114)
Bartel[29]	Cross-sectional (2020)	Canada North America	70	Age: 18 and above Gender: Male: 35.70% (n=25) Female: 64.28% (n=45) Study population: General population	Substances used: Cannabis: 75% (n=53)
Malta[30]	Cross-sectional (2020)	Brazil South America	45 161	Age: 18 and above Gender: Male: 46.40% (n=20 955) Female: 53.60% (n=24 206) Education level: High school: 72.40% (n=32 696) Bachelor's degree: 16.50% (n=7452) Study population: General population	Substances used: Cigarettes: 12% (n=5419) Trends during COVID-19 Cigarettes: Increased: 34% (n=15 355), Decreased: 12.10% (n=5464), No change: 53.90% (n=24 342) Alcohol: Increased: 17.59% (n=7948)
Tzu-Hsuan Chen[31]	Cross-sectional (2020)	United Kingdom Europe	486	Age: 16 and above Study population: General population	Substances used: Cigarettes: 100% (n=486) Trends during COVID-19 Cigarettes: Increased: 17.69% (n=86), Decreased: 14.19% (n=69), No change: 35.80% (n=174)
Kowitt[32]	Cross-sectional (2020)	United States North America	777	Age: 15 and above Gender: Male: 50.10% (n=389) Female: 48.90% (n=380) Others: 1.02% (n=8) Education level: High school: 28.10% (n=218) Bachelor's degree: 33.33% (n=259) Master's degree: 17.90% (n=139) Study population: General population	Substances used: Cigarettes: 83.80% (n=651) E-cigar: 37.70% (n=293) Smokeless tobacco: 21.90% (n=170) Waterpipe tobacco: 13.30% (n=103) Trends during COVID-19 Cigarettes: Increased: 40.90% (n=318), Decreased: 17.80% (n=138), No change: 41.30% (n=321) Attempted to quit Cigarette: Yes: 46.50% (n=361), No: 53.50% (n=416)
Elling[33]	Cross-sectional (2020)	Netherlands Europe	340	Age: 21-90 years Gender: Male: 39.11% (n=133) Female: 60.90% (n=207) Education level: High school: 42.60% (n=145) Bachelor's degree: 35.60% (n=121) Study population: General population	Substances used: Cigarettes:100% (n=340) Trends during COVID-19 Cigarettes: Increased: 13.80% (n=47), Decreased: 18.50% (n=63),No change: 67.70% (n=230)

Table 1. Continued

First author	Study design and year	Region and continent	Sample size	Population characteristics	Result
Dumas[34]	Cross-sectional (2020)	Canada North America	1054	Age: 16 and above Gender: Male: 21.90% (n = 231) Female: 76.40% (n = 805) Others: 1.70% (n = 18) Study population: General population	Substances used: Vape: 11.50% (n = 121) Alcohol: 40.13% (n = 423) Cannabis: 13.80% (n = 145)
Klemperer[35]	Cross-sectional (2020)	United States North America	345	Age: 21 and above Gender: Male: 69% (n = 238) Female: 31.01% (n = 107) Study population: General population	Substances used: Cigarettes: 80.90% (n = 279) E-cigar: 80.90% (n = 279) Trends during COVID-19 Cigarettes: Increased: 30.30% (n = 105), Decreased: 28.30% (n = 98), No change: 41.40% (n = 142) E-cigar: Increased: 29.10% (n = 100), Decreased: 24.90% (n = 87), No change: 46% (n = 158) Attempted to quit cigarette: Yes: 44.05% (n = 152), No: 55.94% (n = 193)
Grossman[36]	Cross-sectional (2020)	United States North America	832	Age: 21 and above Gender: Male: 13.22% (n = 110) Female: 71.27% (n = 593) Others: 15.50% (n = 129) Study population: General population	Substances used: Alcohol: 80% (n = 666) Trends during COVID-19 Alcohol: Increased: 41.70% (n = 347), Decreased: 8.89% (n = 74), No change: 18.75% (n = 156)
Chodkiewicz[37]	Cross-sectional (2020)		443	Age: 18-68 years Gender: Male: 21.40% (n = 95) Female: 78.60% (n = 348) Education level: High school: 40.10% (n = 178) Bachelor's: 58.92% (n = 261) Marital status: Married: 46.05% (n = 204) Unmarried: 47.40% (n = 210) Separated: 6.54% (n = 29) Occupational status: Unemployed: 5.64% (n = 25) Employed: 55.53% (n = 246) Student: 38.82% (n = 172) Study population: General population	Substances used: Alcohol: 72.90% (n = 323) E-cigar: 24.60% (n = 109) Amphetamine: 3.60% (n = 16) Trends during COVID-19 Alcohol: Increased: 13.80% (n = 61), Decreased: 17.40% (n = 77), No change: 41.10% (n = 182) E-cigar: Increased: 5.80% (n = 26), Decreased: 4.90% (n = 22), No change: 14.60% (n = 65) Amphetamine: Increased: 1.40% (n = 6), Decreased: 1.10% (n = 5), No change: 3.80% (n = 182)
Jackson[38]	Cross-sectional (2020)	England Europe	1674	Age: 18 and above Gender: Male: 49.10% (n = 882) Female: 50.90% (n = 852) Study population: General population	Substances used: Alcohol: 38.30% (n = 641) Cigarettes: 17% (n = 284) Attempted to quit cigarette Yes: 39.60% (n = 663) No: 60.39% (n = 1011) Quitted cigarette Yes: 21.30% (n = 356) No: 78.73% (n = 1318)
Garnett[39]	Cross-sectional (2020)	United Kingdom Europe	30 516	Age: 18 and above Gender: Male: 50.44% (n = 15 394) Female: 49.60% (n = 15 122) Study population: General population	Substances used: Alcohol: 72.46% (n = 22 113) Trends during COVID-19 Alcohol: Increased: 26.20% (n = 7995), Decreased: 25.70% (n = 7843), No change: 48.10% (n = 14 678)
Rolland[40]	Cross-sectional (2020)	France Europe	11 391	Age: 16 and above Gender: Male: 47.50% (n = 5415) Female: 52.10% (n = 5932) Others: 0.38% (n = 44) Occupational status: Unemployed: 34.43% (n = 3922) Employed: 56.92% (n = 6486) Student: 8.66% (n = 987) Location: Urban: 77.11% (n = 8784) Rural: 55.95% (n = 2610) Study population: General population	Substances used: Tobacco: 35.60% (n = 4055) Alcohol: 24.80% (n = 2825) Cannabis: 31.20% (n = 3554) Trends during COVID-19 Tobacco: Increased: 8.73% (n = 995), Decreased: 5.17% (n = 589), No change: 10.55% (n = 1208) Alcohol: Increased: 15.46% (n = 1761), Decreased: 10.86% (n = 1237), No change: 36.07% (n = 4109) Cannabis: Increased: 1.84% (n = 210), Decreased: 1.73% (n = 195), No change: 2.31% (n = 263)
Sun[41]	Cross-sectional (2020)	China Asia	6416	Age: 15 and above Gender: Male: 47% (n = 3016) Female: 53% (n = 3400) Study population: General population	Trends during COVID-19 Alcohol: Increased: 32.70% (n = 2098) Cigarette: Increased: 13.60% (n = 873) Quitted cigarette Yes: 0.52% (n = 34) No: 99.47% (n = 6382)

Table 1. Continued

First author	Study design and year	Region and continent	Sample size	Population characteristics	Result
Capasso[42]	Cross-sectional (2020)	United States North America	10 780	Age: 18 and above Study population: General population	Substances used: Alcohol: 54.30% (n=5850) Trends during COVID-19 Alcohol: Increased: 15.74% (n=1697), Decreased: 27.80% (n=1156), No change: 10.72% (n=2997)
Rogersa[43]	Cross-sectional (2020)	America North America	160	Age: 18-65 years Gender: Male: 56.87% (n=91) Female: 43.48% (n=69) Education level: High school: 6.20% (n=10) Bachelor's degree: 74.37% (n=119) Master's degree: 20% (n=36) Study population: General population	Substances used: Alcohol: 52.50% (n=84) Cigarette: 28.75% (n=46) Cannabis: 17.50% (n=28) Psychostimulants: 10% (n=16) E-cigar: 13.12% (n=21) Opioids: 8.75% (n=14)
Vanderbruggen[44]	Cross-sectional (2020)	Belgium Europe	3632	Age: 15 and above Gender: Male: 30.03% (n=1091) Female: 70% (n=2541) Education level: High school: 16.24% (n=590) Bachelor's degree: 78.02% (n=2834) Master's degree: 5.20% (n=189) Study population: General population	Substances used: Alcohol: 58.17% (n=2113) Cigarettes: 15.30% (n=556) Cannabis: 3.02% (n=110)
Callinan[45]	Cross-sectional (2020)	Australia Oceania	1684	Age: 18-65 years Gender: Male: 31.20% (n=525) Female: 64.60% (n=1,148) Others: 0.65% (n=11) Study population: General population	Trends during COVID-19 Alcohol: Increased: 21.80% (n=367), Decreased: 14.60% (n=246)

healthy individuals and is also possibly helpful in treating social anxiety disorder and insomnia.[47]

The least commonly used substances in this study were amphetamine (3.61%), opioids (8.75%), and waterpipe tobacco (13.10%) which is again inconsistent with the results of a study conducted by Soule et al,[27] in the United States which reported usage in 11.8% of individuals during the pandemic. Though the figures presented in the current study are entirely not alarming in terms of substance usage, before the pandemic crisis, there have been reports suggesting an increase in the usage of amphetamine and opioids.[48] The pandemic, in turn, has added to the burden by making individuals vulnerable due to financial losses, health issues, and unemployment which have pushed people to self-medicate to cope with stress, anxiety, and fear. Moreover, there are established harmful effects of the usage of such substances. Firstly, marijuana induces effects on respiratory and immune systems with pathophysiology showing enhanced chronic obstructive pulmonary disease with tobacco usage, immunosuppression, reduced antibody response, and T-lymphocyte activities along with reduced macrophage migration, eventually increasing the severity of COVID-19 infection and mortality, and reducing viral response and clearance. Amphetamine targets CVS, CNS, and immune system by inducing tachycardia, hypertension, cardiomyopathy, ischemic stroke, hypoxia, BBB damage due to loss of tight junction protein, edema, neuroinflammation, and altered HPA axis. When exposed to the SARS CoV-2 virus, individuals using this substance can experience an amplified infection rate, anxiety/despair, endotheliitis, CNS inflammation, and extreme inflammatory response.[49]

India is home to 27 crore tobacco users and is the second-largest producer as well as consumer of tobacco worldwide as per Global Adult Tobacco Survey-India (GATS2) which calls for greater emphasis on tobacco usage. With the ongoing pandemic, smokers are more vulnerable as the very act of smoking leads to contact between the smoker's fingers which might have been contaminated with cigarette products and mouth leading to an easy transmission of the virus. Besides, according to experts, smokers can develop severe infections and probably die as the virus directly targets the lungs and respiratory system.[50] As shown in the present study, there has been absolutely no change in the usage of amphetamine even during the COVID-19 pandemic i.e., 41.08% reported no change and there has been only a slight increase at 1.35%. To support the above statement, it has been observed that in countries like the United States, there has been a rising consumption rate since the late 1990s, and now in Asia as well. A high prevalence of amphetamine use is reported among homosexual men, especially in Asia. Another reason is its easy manufacturing from widely available pseudoephedrine. This particular substance can be consumed either orally, smoked, injected, inserted rectally, or snored and has a half-life of more than 12 hours producing a rapid, pleasurable release of dopamine,

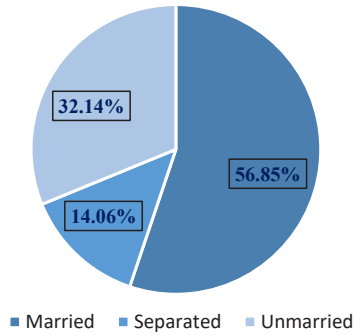

Figure 3. Marital status of individuals

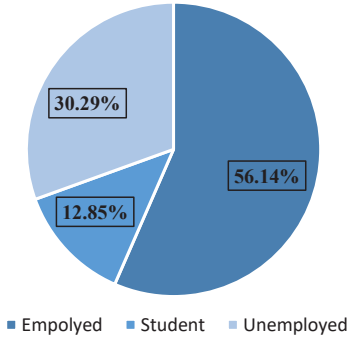

Figure 4. Occupational status of individuals

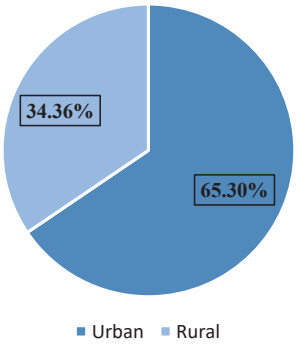

Figure 5. Locality of individuals

Table 2. Trends in substances used during COVID-19 pandemic by the general population

	Mean (%)	Total population (n)	Sample size (N)
Tobacco			
Increased	12.42%	1895	15247
Decreased	5.52%	754	13643
No change	21.77%	3091	14198
Alcohol			
Increased	20.91%	23230	111079
Decreased	18.94%	10971	57898
No change	42.01%	23851	56769
Vape			
Increased	10%	52	542
Decreased	15.49%	82	542
No change	Nil	Nil	Nil
Marijuana			
Increased	13.46%	73	542
Decreased	12.36%	67	542
No change	NIL	NIL	NIL
Cannabis			
Increased	2.04%	237	11610
Decreased	1.82%	212	11610
No change	2.73%	317	11610
Psychostimulants			
Increased	11.41%	25	219
Decreased	5.02%	11	219
No change	15.06%	33	219
Anxiolytic/BZD			
Increased	9.58%	21	219
Decreased	2.28%	5	219
No change	25.11%	55	219
Heroin			
Increased	8.67%	19	219
Decreased	4.10%	9	219
No change	9.13%	20	219
Methadone			
Increased	10.04%	22	219
Decreased	7.30%	16	219
No change	52.50%	115	219
BUP			
Increased	3.19%	7	219
Decreased	0.91%	2	219
No change	9.58%	21	219
E-Cigar			
Increased	15.98%	126	788
Decreased	13.83%	109	788
No change	28.29%	223	788
Cigarettes			
Increased	31.02%	16958	54667
Decreased	12.37%	5971	48251
No change	52.66%	25410	48251
Amphetamine			
Increased	1.35%	6	443
Decreased	1.12%	5	443
No change	41.08%	182	443

Moreover, based on the results of this study, 48.08% of individuals reported not attempting to quit cigarettes and 95.17% were not successful in quitting cigarettes during the COVID-19 pandemic.

serotonin, and norepinephrine which results in euphoria, amplified levels of alertness, and elevated energy levels. It is sold by several common names including "Meth", "Crystal Meth", "Speed", or "Ice".[51] The pandemic crisis has already impacted the drug markets by causing shortages in drug supplies which directly had an impact on prices being hiked, and the purity of substances getting reduced. For example, methamphetamine and cannabis sales have been reduced due to restrictions on air travel, borders being shut down, and restrictions imposed on movements to curb the spread of infection from one region to another.[52] This might be a reason for the decrease in the use of amphetamine and cannabis reported in the present study by 1.12% and 1.82% respectively. Although this is not a very significant rate, its effect is indeed noticeable on drug sales across various continents

Regarding trends in the substances used during the COVID-19 pandemic in the present study, Tobacco usage increased by 12.42% and alcohol by 20.91%. This could be due to societal and cultural processes. Various factors could be at play for influencing individuals such as the prevalence of SUD, socio-economic conditions, and misinformation. For example, in the United States of America, there were reports of an increase in tobacco sales, and in India and Italy, there was an increase in tobacco use at indoor premises. Even during stricter lockdown measures, liquor stores have remained open in the USA (except for Pennsylvania) and Nigeria where liquor stores are considered essential for business and alcoholic drinks are essential commodities.[53] However, there have been consistencies as well, in terms of usage percentage being at 13.30% and 8.75% for waterpipe tobacco and opioids, respectively, in the studies by Kowitt et al[32] and Rogers et al[43] It has been observed in previous studies that in the long run, opioid addicts develop malnutrition owed to their poor eating habits, lack of appropriate skills combined with knowledge in preparing nutritious or healthy food, anorexia, and poor financial conditions besides hormonal and immunological disorders that make them vulnerable to various diseases like HIV and predispose opium addict patients to pressure.[54] Likewise, in the present study, a 31.02% increase in cigarette consumption was observed which is similar to the results of a study by Sun et al[41] with an overall rate of alcohol and smoking increased at 32.7%.

The combined effect of economic crises and trauma caused by the outbreak of the COVID-19 disease is making it a challenge for individuals to cope with such a grave situation. Shrinkage of social networks, lack of socializing with people, deaths and morbidities due to the infection, financial losses, unemployment, etc. leave people with no coping resources. This, in turn, pushes them into the trap of seeking solace in some form or the other, sometimes even at the cost of their health by involving in the practices of substance use and abuse. For this reason, socially protective measures are the need of the hour for the best interest of public health and their need to use a substance that might exacerbate the risk factors of post-COVID crisis.[55] To reduce substance abuse, as a pervasive problem faced globally, promising strategies are required including providing sound education and raising knowledge and awareness regarding substance use and abuse from a very young age.

This study was conducted with some limitations. First, the studies from Asia were deficient due to lack of sufficient data reported and published. Second, secondary data are prone to having extreme responses based on respondents' knowledge and awareness.

Conclusion

The COVID-19 pandemic has led to the realization of the importance of public health and the mutual need for global action for supporting people's health and well-being. Regarding the emergence of COVID-19 and its impact on substance use, the pandemic has shaken individuals globally, touching integral aspects of their lives and exposing them to unwanted vulnerabilities that have increased the burden of substance use and abuse for all age groups. Several people have lost their family members, the middle-class individuals have been pushed to poverty due to unemployment, students have lost their academic years, and the out-of-pocket expenditure in developing countries has increased burning a hole in their pockets due to hospitalization and treatment costs, therefore exposing myriad problems. Thus, due to COVID-19 disease, individuals have resorted to drug consumption and abuse for coping with this difficult situation and also as a mode of escape from facing their realities. It is essential for all countries worldwide to develop measures in the best interest of the public to support them in the crisis especially for people with the habit of using and abusing substances. The focus should be on incorporating effective demand, supply, and strategies to reduce the harm that comes with the usage of many substances. Any strategy must be evidence-informed, culturally acceptable in different regions, practically possible, and equitable which are the key requirements before the formulation of policies with the help of the strategies designed. In other words, community actions and local actions lead to a global impact and the time for the accomplishment is now.[53] Information dissemination is important during a public health crisis. Timely problem identification and strengthening referral services play a critical role for high-risk individuals, youth, and adolescents particularly by referring them to appropriate health centers to achieve better prognosis. An understanding of "what works best" is essential in different regions for implementing programs with limited resources. It is vital to determine and identify gaps in services provided for substance use and abuse prevention and treatment.[56] Finally, increasing awareness about substances which are used

without realizing their toxic properties is necessary. For instance, research on the belief that "*waterpipe smoking is less harmful than cigarette smoking*" has proven that through waterpipe smoking, smokers inhale higher levels of toxic particles in comparison to cigarette smoking and also are at higher risk of developing tobacco-related and cardiovascular diseases.[57]

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All authors read and approved the final manuscript.

Conflict of Interests
None declared.

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