

## Narrative review on the spectrum of diseases prevalent among substance-addicted populations and their interconnected health dynamics

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**Abstract** Substance addiction is a complex phenomenon characterized by the dysfunction of the brain's reward system and neuroplasticity, leading individuals to lose control over their behaviour. This review explores the diverse health implications of addiction, including its impact on liver diseases, cardiovascular conditions, respiratory issues, cancers, infectious diseases, gastrointestinal problems, and mental disorders. Heavy alcohol consumption, tobacco use, illicit drug abuse, and prescription drug misuse contribute significantly to these health burdens, affecting various organs and systems in the body. Respiratory issues arise from tobacco smoking, inhalation of illicit drugs, and volatile chemicals, causing chronic obstructive pulmonary disease, lung cancers, and bronchial asthma. Substance addiction is also linked to various cancers, particularly lung cancer from tobacco, oral cancers from tobacco and alcohol, and oesophageal cancers from alcohol and prescription drugs. Furthermore, addictive substances impair immunity, making individuals more susceptible to infectious diseases like pneumonia, tuberculosis, and HIV/AIDS, especially among injection drug users. The interconnected nature of substance addiction with mental health disorders, genetic factors, environmental influences, and social determinants underscores the need for comprehensive public health strategies. These strategies should encompass education, prevention programs, access to treatment and support services, harm reduction approaches, and destigmatization efforts to address substance addiction comprehensively and improve overall health outcomes for individuals and communities.

**Keywords:** addiction, diseases, health, substance

### Introduction

Addiction occurs with the dysfunction of the brain reward system resulting in individuals losing control of a particular behaviour (Pickett, 2013). If a person continuously craves something that might lead to obsession according to neuroplasticity (O'Brien, 2009). Along with that, frequent substance usage leads to a reduction of the brain's production, and absorption of dopamine creating a chemical imbalance (Anderson et al, 2009; Zou et al., 2017). Substances are licit and illicit psychoactive drugs including alcohol and tobacco that increase the secretion of dopamine neurotransmitters resulting in intoxication-related mental and physical dysfunctions (Zou et al., 2017). Hence, continuous use of these substances might diminish brain resistance and ultimately end up with addiction.

As per the statistics of the United Nations on Drugs and Crime, more than a quarter of individuals

are habituated to substance use. Among them, more than 35 million are encountering substance use disorders (United Nations Office on Drugs and Crime (UNODC), 2020). As the reason for this global hazard, once individuals use the substances, they will temporarily disconnect from the real world and become euphoric condition with escalating feelings of pleasure. In terms of repeated substance usage affects increase tolerance and that will be gradually arrived at substance misuse, substance dependence, and substance abuse. World health organization (WHO) revealed that harmful alcohol usage has been caused to consist of more than 200 diseases and injuries related to mental, physical and other noncommunicable conditions (World Health Organization [WHO], 2024). A study conducted on multimorbid patients with substance use disorders revealed, 33.7% with hypertension, 16.2% with, 8.9% with ischemic heart diseases, and 13.7% with diabetes (Halpin et



al., 2013). Apart from that, substance involvement leads to increase the risk of health implications like liver diseases, cardiovascular diseases, respiratory issues, cancer, infectious diseases, gastrointestinal issues, malnutrition, and mental health disorders.

#### *Liver diseases related to substance addiction*

Excessive alcohol usage mainly causes various liver issues including steatosis (fatty liver), cirrhosis, steatohepatitis and alcoholic hepatitis (Pateria et al., 2013). Delving to the biochemical changes associated with alcohol, it increases the endoplasmic reticulum through the induction microsomal biotransformation in the body (Zakhari, 2006). In the process of alcohol metabolism, due to the gene variation alcohol dehydrogenase and aldehyde dehydrogenase are activating and execute the acetaldehyde metabolism which more prone to damage the liver tissues. Steatohepatitis is another condition that leads to liver inflammation and liver damage because of the fatty build-ups arising consequence of alcohol consumption (Rees, 2023). Empirical evidence suggests that consistent alcohol use can lead to steatosis, progressing to steatohepatitis. Among those affected, 16% of patients have a risk of developing cirrhosis within five years (Deleuran et al., 2012). Despite primarily affecting to lungs, tobacco products can indirectly impact on liver during the metabolism. Some medications, when abused or taken in high doses, can cause drug-induced liver injury (DILI) (Rutledge & Asgharpour, 2020). On the other hand, Opioid misuse, whether through prescription opioids or illicit drugs like heroin, can impair liver health. Chronic opioid use has been associated with abnormalities in liver function tests and an increased risk of developing liver diseases sue allocation and equity such as hepatitis C and hepatitis B due to intravenous drug use (Verna et al., 2019). Delving to influence of methamphetamine on liver damage, Chronic methamphetamine use can lead to liver damage and dysfunction. Methamphetamine abuse has been associated with hepatitis, liver fibrosis, and an increased risk of liver disease progression. Intravenous drug use, often associated with methamphetamine abuse, can also increase the risk

of viral hepatitis and other infections (Halpin et al., 2013).

#### *Cardiovascular diseases related to substance addiction*

Cardiovascular diseases related to substance addiction comprise a wide range of conditions that result from the harmful effects of various substances on the cardiovascular system. Substance addiction can lead to both acute and chronic cardiovascular problems, affecting the heart, blood vessels, and circulation. Many substances, including stimulants like cocaine and amphetamines, can cause an increase in blood pressure. Prolonged elevation of blood pressure can lead to hypertension, a significant risk factor for heart disease, stroke, and other cardiovascular complications (Geoffrion, 2024). Substance abuse, particularly tobacco smoking and alcohol consumption, are major risk factors for the development of atherosclerosis. Atherosclerosis is the formation of plaque (cholesterol, fat, and other substances) in the arteries, leading to narrowing and thickening of the arteries (Kiechl et al., 1998). This condition can restrict blood flow to vital organs, including the heart and brain, increasing the risk of heart attack and stroke. Similarly certain substances, such as cocaine, amphetamines, and excessive alcohol, can disrupt the normal electrical activity of the heart, leading to arrhythmias (irregular heartbeats). Arrhythmias can range from mild palpitations to life-threatening conditions like ventricular fibrillation, which can result in sudden cardiac arrest. On the other hand, intravenous drug use, particularly with contaminated needles, increases the risk of infective endocarditis, an inflammation of the inner lining of the heart chambers and valves. Endocarditis can lead to heart valve damage, heart failure, and systemic infections. Gan et al. (2021) conducted cohort study revealed that alcohol, cannabis, opioid and stimulant related substance disorders are directly affecting to consist of eleven categories of cardiovascular disorders. Researchers revealed that continuous stimulation of central nervous system resulting amphetamine addiction leads to increase the heart rate and blood pressure (Kevil et al., 2019).

### *Respiratory issues related to substance addiction*

As per the global statistics, tobacco smoking is the leading cause of preventable death worldwide and is associated with numerous respiratory diseases. Excessive use of tobacco products causes for range of respiratory issues including chronic obstructive pulmonary disease, lung cancers, and bronchial asthma (Close, 2023). Long-term smoking can cause chronic bronchitis and emphysema, leading to airflow limitation, cough, sputum production, and shortness of breath. Moreover, Inhalation of certain substances, such as illicit drugs and volatile chemicals, can cause acute and chronic respiratory problems (Büker et al., 2011). Cocaine inhalation can lead to acute respiratory effects, such as bronchospasm, chest pain, and shortness of breath. Chronic cocaine use is associated with pulmonary complications, including pulmonary edema, pulmonary hypertension, and lung damage. Studies emphasized that Methamphetamine abuse can cause lung damage and pulmonary complications, including acute respiratory distress syndrome (ARDS), pneumothorax, and pulmonary hypertension (Javed et al., 2021; Shehataa et al, 2023). Additionally, Inhalant abuse, including the sniffing of solvents, aerosols, and volatile chemicals, can cause acute respiratory effects, such as cough, wheezing, and respiratory depression. Chronic inhalant abuse can lead to long-term respiratory problems, including bronchitis, pneumonia, and impaired lung function (Baydala, 2010).

### *Cancers related to substance addiction*

Compulsive use of substances is having substantial impact on increased risk of certain cancers. The nature of cancers related to substance addiction varies depending on the specific substances involved and the associated behaviors. Tobacco addiction is a major risk factor for lung cancer, as smoking exposes the lungs to carcinogens present in tobacco smoke (Hecht, 2011). At the same time tobacco addiction increases the risk of cancers in the oral cavity, pharynx, larynx, and esophagus and urinary bladder cancer as well (Rashidian et al., 2021). Smokeless tobacco products also pose a risk for oral cancers (Mu et al., 2021). Focusing a case control study which has been conducted using

patients who had upper esophageal cancer reported that individuals who has opium dependent more prone to laryngeal cancers rather than smokers (Bakhsae et al., 2017). As per the case studies in North America and Western Europe, usage of alcohol and smoking were denoted as the risk factors for Squamous cell carcinoma of the oesophagus (Weidenbaum & Gibson, 2022). Thus, carcinogenic byproducts of alcohol metabolism, polycyclic aromatic hydrocarbons and nitrosamines are the main causes for these esophageal cancers (Seitz et al, 2006; Anderson et al, 2009). One of the studies revealed that alcohol, prescription drugs, and illicit drugs related substance used disorders are associated a high risk of prostate cancer (Chhatre et al., 2014).

### *Infectious diseases related to substance addiction*

The influence of addictive substances on infectious diseases can be multifaceted and depend on type of substance, the route of administration, the individuals' overall health and the other social factors. Thus, prolonged use addictive substances such as alcohol, opioid, and methamphetamine can reduce the body's immunity against infections, making individuals more susceptible to infectious diseases (Friedman et al., 2006). For instance, smoking tobacco damages the lungs, making smokers vulnerable to respiratory infections like pneumonia and tuberculosis. Moreover, smoking damages the lungs and impairs their ability to clear pathogens effectively. This can cause to the accumulation of bacteria, viruses, and other microorganisms in the respiratory tract increasing the risk of pneumonia. Tobacco smoke stimulates the production of mucus in the respiratory tract. Excessive mucus can trap pathogens and create an environment suitable to infections like pneumonia. At the same time, excessive alcohol usage also suppresses the immune system, exacerbating the risk of infections like HIV/AIDS (Colfax & Guzman, 2006). In the context of addictive drug administration via needle injection (e.g., cocaine, heroin, morphine, opioids), there exists a heightened likelihood of contracting hepatitis B, and sexually transmitted diseases attributable to the transmission of diverse infectious agents (Volkow, 2014). Because Needle sharing among individuals who inject drugs is a significant risk factor for the transmission of blood-borne infections such as

hepatitis B, hepatitis C, and HIV/AIDS (Aghaei et al., 2023). Researchers have emphasized that there is a high risk of developing endocarditis, a serious infection of the inner layer of the heart, among drug users who inject opioids using needles (Moss & Munt, 2003).

#### *Gastrointestinal Issues related to substance addiction*

Gastrointestinal issues can be widely seen with the substances that are taken orally. Most heavy alcohol users exhibit reflux esophagitis, gastritis, pancreatitis, malabsorption, and nutritional deficiencies (Bode, 1997). Researchers revealed that despite alcohol not being carcinogenic the large amount of ethanol metabolite known as acetaldehyde has been found as a local carcinogen in human body (Seitz et al., 2006). Anderson et al. (2009) found that alcohol consumption during early adulthood caused reflux esophagitis. When alcohol enters to the gastrointestinal track, the pressure of gastroesophageal sphincter is going to reduce and that can lead to consist Gastroesophageal reflux disease (Anderson et al., 2009). Hence, heavy alcohol addicted people are exhibiting the symptoms of burning sensation in their chest, difficulty to swallow, upper abdominal chest pain and so on (Klauser et al., 1990). Further revealed that heavy drinking involve with the inflammation of pancreas in human body leading to acute pancreatitis (Herreros-Villanueva et al., 2013).

#### *Mental disorders related to substance addiction*

There is a controversy interaction can be appeared between addictive substances and mental disorders. Sometimes due to some mental conditions like anxiety, depression and social phobia people might initiate substance use and gradually it might become problematic (Al-Khair, 2023). Thereby, studies revealed that certain stimulants such as cocaine and amphetamine were caused to feel depressed and anxious and prolong usage of cocaine was affect to develop symptoms of psychosis (Martin, 1999). In contrast, symptoms related to certain mental health conditions can appear within individuals who are addicted to substances due to the cycle of addiction, withdrawal, and relapse can further exacerbate underlying mental health disorders. Apart from that,

genetic factors can play a significant role in both substance use disorders and mental health disorders. Individuals with a family history of addiction or mental illness may be more vulnerable to developing both conditions. Similarly, environmental stressors, such as trauma, chronic stress, or social isolation, can contribute to the development of both substance abuse and mental health disorders. These factors may create a cycle of self-destructive behaviors and negative coping mechanisms. Public health researchers found that at least 1 in 8 adolescents has been addicted to illicit substances in the last year. Despite these psychological negative consequences, adolescents' initiation of substance usage has escalated all over the world. Proving that 32.6% of illicit drug-using adolescents have been reported from the United States Advanced Level classes in 2022 (National Institute on Drug Abuse, 2022) and 36.5% of substance-using Advanced Level students have been reported from Sri Lanka in 2023 (Thennakoon et al., 2023). Diving the adolescents' characteristics, curiosity, gaining independence, and peer influence were identified as the most prominent factors of substance initiation during adolescence. Further denotes that certain personality traits, attitudes, and social factors also were affected to enhance the instigation of substance. As per the previous research findings, individuals who suffer from anxiety and depression were prone to instigate alcohol and tobacco products to hinder their anxiety and depressive related feelings. In contrast, dysregulation of serotonin and dopamine due to excessive alcohol usage leading to generate depressive symptoms within individuals. Apart from that, some drugs, such as cannabis, LSD, and certain synthetic cannabinoids, can induce psychotic symptoms like hallucinations, delusions, and disorganized thinking. Prolonged use or high doses can increase the risk of developing persistent psychotic disorders like schizophrenia (Martin, 1999).

#### **Conclusion**

Substance addiction represents a complex and multifaceted issue with profound implications for public health and individual well-being. The dysfunction of the brain's reward system, coupled with neuroplasticity and the impact on dopamine production, underlies the development of addiction.

Globally, millions of individuals suffer from substance use disorders, highlighting the urgent need for effective prevention and intervention measures. The review sheds light on the diverse health consequences of substance addiction, ranging from liver diseases and cardiovascular issues to respiratory problems, cancers, infectious diseases, gastrointestinal issues, and mental disorders. Heavy alcohol consumption, tobacco smoking, illicit drug use, and prescription drug misuse contribute significantly to these health burdens, affecting various organs and systems in the body.

Furthermore, the review emphasizes the interconnected nature of substance addiction with mental health disorders, genetic predispositions, environmental factors, and social influences. The bidirectional relationship between addiction and conditions like anxiety, depression, psychosis, and schizophrenia underscores the complexity of addressing substance use disorders comprehensively. In light of these findings, there is a critical need for comprehensive public health strategies that address not only the biological aspects of addiction but also the social, psychological, and environmental factors that contribute to substance misuse. Education, prevention programs, access to treatment and support services, harm reduction approaches, and addressing stigma are essential components of a holistic approach to tackling substance addiction and improving overall health outcomes for individuals and communities.

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### **Conflict of interest**

The author declares no conflicts of interest.

### **Author contribution**

Articles collection, Articles filtering according to the scope of the study, Important information extraction, critical reviewing, Address to feedback and editing.

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