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Understanding Substance Abuse and Addiction

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Review Article

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ABSTRACT

Addiction is a compulsive brain disorder that cause the use of substance despite harmful sideeffects. The abuse of drugs and alcohol is the leading cause of preventable illnesses and premature death in our society. Many factors like genetic and environmental factors play a major role in addiction. Neuromodulation provides us with a unique opportunity to directly apply neuroscientific knowledge to the treatment of addiction. It will remain that the treatment is mainly for psychosocial and behavioral interventions.

INTRODUCTION

The word addiction is derived from latin term enslaved by or bound to [1-5]. Addiction is a chronic, often relapsing brain disease that causes compulsive substance seeking and use, despite harmful consequences to the addicted individual and to those around him or her. Addiction can be of any type of substance addicted namely drugs, alcohol and nicotine. The importance of substance abuse treatment cannot be overstated, and fortunately many effective treatments are available. Drug and alcohol use is associated with high-risk sexual behaviors and injection drug use [6,8,9] are the two major modes of HIV transmission. The importance of substance abuse cannot be overstated and effective treatments are available [10-14].

Types of Addiction

Different types of addictions can be observed. They are:

- Drug Addiction [15-18]
- Alcohol addiction
- Food Addiction
- Gambling
- Nicotine addiciton
- Risk factors of Substance Abuse

Genetic factors:

Genetic factors contribute widely to addiction. Epidemiological factors implicit that more than 40-60% of the patients addicted to alcohol are mainly due to genetic factors.

Alcohol [19,31,68,94]:

Alcohol is a legal drug that can produce pleasant effect with lower amounts that can produce dangerous effects with higher amounts. Excessive drinking of alcohol leads to alcoholism that can often lead to depression. It can cause serious liver problems, great risk of heart disease, impotency, infertility and premature aging. Abruptly stopping alcohol can be dangerous. Treatment is more successful in than when

the illness has been allowed to progress for years. Early treatment can reduce alcoholism's destructive impact.

Stimulants:

Stimulants give temporary illusion of enhanced power and energy. As the initial elevation of mood fades, depression and other medical problems emerge which includes Heart attacks, Seizures, Strokes and Violent behavior [21,23,25]. The use of cocaine during pregnancy leads to miscarriages and low weight birth babies. Long term use can lead to psychosis with delusions and hallucinations [26-32].

Sedatives:

Sedatives are highly effective medications to relieve anxiety and promote sleep. Harmful effects can occur when they are excessively taken without the physician supervision [33,36,37].

Nicotine:

Nicotine has severe effects same as heroin. Due to the addictive properties and withdrawal of unpleasantness of the product, which involves the feeling of irritability, anger, insomnia and depression [35,38,39,40]. Excessive and Continued smoking leads to lung cancer, High Blood Pressure and Heart Attacks.

Hallucinogens:

Hallucinogens are drugs such as LSD (acid) or the new designer drugs (ecstasy) that are taken orally and cause hallucinations and feelings of euphoria [41,67,93]. Excessive use of ecstasy, combined with strenuous physical activity, can lead to death from dehydration or an exceptionally high fever [42,43,45,48].

Inhalants:

Inhalants are breathable chemicals. They are commonly abused by teenagers because they are easy to obtain and because they produce mind-altering effects when sniffed or "huffed." [49-53]. These chemicals reach the bloodstream very quickly and can be deadly [54,55,56]. High Concentrations of inhalants can cause heart attack or suffocation whereas the long term use causes damage to the nervous system.

Why do some persons get addicted?

No single factor can predict whether a person will become addicted to drugs. Risk for addiction is influenced by a combination of factors that include individual biology, social environment, and age or stage of development [57-64]. The more risk factors an individual has, the greater the chance that taking drugs can lead to addiction. For example:

Biology: The genes that people are born with—in combination with environmental influences—account for about half of their addiction vulnerability [65-68]. Additionally, gender, ethnicity, and the presence of other mental disorders may influence risk for drug abuse and addiction.

Environment: A person's environment includes many different influences, from family and friends to socioeconomic status and quality of life in general [69,70,71,72]. Factors such as peer pressure, physical and sexual abuse, stress, and quality of parenting can greatly influence the occurrence of drug abuse and the escalation to addiction in a person's life.

Development: Genetic and environmental factors interact with critical developmental stages in a person's life to affect addiction vulnerability. Although taking drugs at any age can lead to addiction, the earlier that drug use begins, the more likely it will progress to more serious abuse, which poses a special challenge to adolescents. Because areas in their brains that govern decision making, judgment, and self-control are still developing, adolescents may be especially prone to risk-taking behaviors, including trying drugs of abuse [73-76].

Brain Structure after Drug Abuse

Drugs contain chemicals that tap into the brain's communication system and disrupt the way nerve cells normally send, receive, and process information. There are at least two ways that drugs cause this

disruption: (1) by imitating the brain's natural chemical messengers and (2) by overstimulating the "reward circuit" of the brain. Some drugs (e.g., marijuana and heroin) have a similar structure to chemical messengers called neurotransmitters, which are naturally produced by the brain^[77-82]. Glutamate is a neurotransmitter that influences the reward circuit and the ability to learn. When the optimal concentration of glutamate is altered by drug abuse, the brain attempts to compensate, which can impair cognitive function^[83-89].

Dopamine is the primary neurotransmitter of the reward system in the brain. It plays a role in regulating movement, emotion, cognition, motivation, and feelings of pleasure. Natural rewards, like eating, as well as recreational drug use cause a release of DA, and are associated with the reinforcing nature of these stimuli. Nearly all addictive drugs, directly or indirectly, act upon the brain's reward system by heightening dopaminergic activity^[90,91].

Diagnosis of Addiction in Patients

People who suffer from addiction often have one or more accompanying medical issues, which may include lung or cardiovascular disease, stroke, cancer, and mental disorders. Imaging scans, chest X-rays, and blood tests show the damaging effects of long-term drug abuse throughout the body. For example, research has shown that tobacco smoke causes cancer of the mouth, throat, larynx, blood, lungs, stomach, pancreas, kidney, bladder, and cervix. In addition, some drugs of abuse, such as inhalants, are toxic to nerve cells and may damage or destroy them either in the brain or the peripheral nervous system^[92,93,94].

Understanding Addiction

Many people do not understand why or how other people become addicted to drugs. It is often mistakenly assumed that drug abusers lack moral principles or willpower and that they could stop using drugs simply by choosing to change their behaviour^[95,96]. In reality, drug addiction is a complex disease, and quitting takes more than good intentions or a strong will. In fact, because drugs change the brain in ways that foster compulsive drug abuse, quitting is difficult, even for those who are ready to do so. Through scientific advances, we know more about how drugs work in the brain than ever, and we also know that drug addiction can be successfully treated to help people stop abusing drugs and lead productive lives.

Drug addiction is a preventable disease. Results from NIDA-funded research have shown that prevention programs involving families, schools, communities, and the media are effective in reducing drug abuse. Although many events and cultural factors affect drug abuse trends, when youths perceive drug abuse as harmful, they reduce their drug taking^[97,98,99]. Thus, education and outreach are key in helping youth and the general public understand the risks of drug abuse. Teachers, parents, and medical and public health professionals must keep sending the message that drug addiction can be prevented if one never abuses drugs.

Scientists began to study addictive behavior in the 1930s, people addicted to drugs were thought to be morally flawed and lacking in willpower. Those views shaped society's responses to drug abuse, treating it as a moral failing rather than a health problem, which led to an emphasis on punishment rather than prevention and treatment.

As a result of scientific research, we know that addiction is a disease that affects both the brain and behavior. We have identified many of the biological and environmental factors and are beginning to search for the genetic variations that contribute to the development and progression of the disease. Scientists use this knowledge to develop effective prevention and treatment approaches that reduce the toll drug abuse takes on individuals, families and communities.

Despite these advances, many people today do not understand why people become addicted to drugs or how drugs change the brain to foster compulsive drug use^[99,100].

Treatment of Addiction

Effective treatment options:

Medication and behavioral therapy, especially when combined, are important elements of an overall therapeutic process that often begins with detoxification, followed by treatment and relapse prevention. Easing withdrawal symptoms can be important in the initiation of treatment; preventing relapse is necessary for maintaining its effects. And sometimes, as with other chronic conditions, episodes of relapse may require a return to prior treatment components. A continuum of care that includes a customized treatment regimen—addressing all aspects of an individual's life, including medical and mental health services—and follow-up options (e.g., community- or family-based recovery support systems) can be crucial to a person's success in achieving and maintaining a drug-free lifestyle [100].

Medication:

Medications can be used to help reestablish normal brain function and to prevent relapse and diminish cravings. Currently, we have medications for opioids (heroin, morphine), tobacco (nicotine), and alcohol addiction and are developing others for treating stimulant (cocaine, methamphetamine) and cannabis (marijuana) addiction. Most people with severe addiction problems, however, are polydrug users (users of more than one drug) and will require treatment for all of the substances that they abuse.

Opioids: Methadone, buprenorphine and, for some individuals, naltrexone are effective medications for the treatment of opiate addiction^[98-100].

Tobacco: A variety of formulations of nicotine replacement therapies now exist—including the patch, spray, gum, and lozenges are used for the treatment of nicotine addiction. bupropion and varenicline are the medication options for nicotine addiction^[99].

Alcohol: Naltrexone, acamprosate, disulfiram and topiramate are the drugs used in the treatment of alcohol addiction. Naltrexone blocks opioid receptors that are involved in the rewarding effects of drinking and in the craving for alcohol. It reduces relapse to heavy drinking and is highly effective in some but not all patients—this is likely related to genetic differences [101].

Outpatient behavioral treatment

It encompasses a wide variety of programs for patients who visit a clinic at regular intervals. Most of the programs involve individual or group drug counseling. Some programs also offer other forms of behavioral treatment such as Cognitive behavioural therapy, motivational activities and family therapy [100,101].

Recent Studies on Addiction

The compound examined in the study, known as 6'-guanidinonaltrindole (6'-GNTI), targets the kappa opioid receptor (KOR). Located on nerve cells, KOR plays a role in the release of dopamine, a neurotransmitter that plays a key role in drug addiction. Drugs of abuse often cause the brain to release large amounts of dopamine, flooding the brain's reward system and reinforcing the addictive cycle. While KOR has become the focus for drug discovery efforts aimed at treating addiction and mood disorders, KOR can react to signals that originate independently from multiple biological pathways, so current drug candidates targeting KOR often produce unwanted side effects [97-100]. Compounds that activate KOR can decrease the rewarding effects of abused drugs, but also induce sedation and depression.

Future Prospects

Neuromodulation provides us with a unique opportunity to directly apply neuroscientific knowledge to the treatment of addiction. However, more research is needed to ensure the efficacy, safety and feasibility of the various neuromodulation techniques that are now available [101,102].

CONCLUSION

It doesn't appear optimistic to get the drugs which are of short and long term used for the treatment of addiction. It will remain that the treatment is mainly for psychosocial and behavioral interventions.

Behavioral interventions are not just to increase the likelihood that these patients will take effective medications but also to assist them in improving their interpersonal, educational, and vocational skills so as to develop positive rather than just negative reasons for wanting to stop drug use [103-105].

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